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**MULTIDIMENSIONAL FACTORS AFFECTING DIGITAL
FINANCIAL LITERACY: THE CASE OF CAMEROON**

YÜKSEK LİSANS TEZİ

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ETİK SÖZLEŞME

Tokat Gaziosmanpaşa Üniversitesi Lisansüstü Eğitim Enstitüsü tez yazım kılavuzuna göre, Prof. Dr. Mihriban Coşkun ARSLAN Danışmanlığında hazırlamış olduğum “Multidimensional Factors Affecting Digital Financial Literacy: The Case Of Cameroon” adlı Yüksek Lisans tezinin bilimsel etik değerlere ve kurallara uygun, özgün bir çalışma olduğunu, aksinin tespit edilmesi halinde her türlü yasal yaptırımını kabul edeceğimi beyan ederim.

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Oumaru ADAMU tarafından hazırlanan “**Multidimensional Factors Affecting Digital Financial Literacy: The Case Of Cameroon**” adlı tez çalışmasının savunma sınavı 01/12/2025 tarihinde yapılmış olup aşağıda verilen Jüri tarafından Oy Birliği ile Tokat Gaziosmanpaşa Üniversitesi Lisansüstü Eğitim Enstitüsü İşletme Anabilim Dalı / Muhasebe ve Finansman Bilim Dalı’nda Yüksek Lisans Tezi olarak kabul edilmiştir.

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DEDICATION

I extend my deepest gratitude to my supervisor - Prof. Dr. Mihriban Coşkun ARSLAN, and to my Professors whose guidance and unwavering support have been invaluable throughout this journey. To Savana Islamic Finance, your insights and contributions have enriched my understanding and strengthened the foundation of this work. To Aisha Jibrin Danpullo, your encouragement and belief in my research have been a source of motivation and inspiration.

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ÖZET

DİJİTAL FİNANSAL OKURYAZARLIĞI ETKİLEYEN ÇOK BOYUTLU FAKTÖRLER: KAMERUN ÖRNEĞİ

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Dijitalleşen küresel finans sistemiyle birlikte, Dijital Finansal Okuryazarlık (DFL), özellikle Kamerun gibi gelişmekte olan ekonomilerde finansal kapsayıcılık ve sürdürülebilir kalkınma için kritik bir yetkinlik haline gelmiştir. Bu çalışma, Kamerun örneği üzerinden bireylerin çok boyutlu dijital finansal okuryazarlık düzeylerini etkileyen faktörleri belirlemeyi ve literatürdeki mevcut boşluğu doldurmayı amaçlamaktadır. Araştırmada nicel araştırma yöntemi benimsenmiş olup, veriler Aralık 2024 ile Şubat 2025 tarihleri arasında üniversite öğrencileri ve mikrofinans müşterilerinden oluşan 662 katılımcıdan anket tekniği ile toplanmıştır. Elde edilen veriler IBM SPSS istatistik programı kullanılarak faktör analizi, varyans analizi ve çoklu regresyon modelleri ile test edilmiştir.

Çalışmanın bulguları, literatürdeki genel beklentinin aksine, yaş, cinsiyet, eğitim düzeyi, gelir ve meslek gibi sosyo-demografik değişkenlerin, katılımcıların dijital finansal okuryazarlık düzeyleri üzerinde istatistiksel olarak anlamlı bir açıklayıcı olmadığını ortaya koymuştur. Yapılan faktör analizi sonuçları, DFL kavramının tek bir boyuta indirgenemeyeceğini, aksine çok boyutlu ve karmaşık bir yapı sergilediğini doğrulamıştır.

Sonuç olarak bu araştırma, Kamerun bağlamında dijital finansal okuryazarlığın yalnızca demografik özelliklerle açıklanamayacağını göstermektedir. Bulgular, finansal okuryazarlığı artırmaya yönelik politikalarda demografik hedeflemelerin ötesine geçilmesi gerektiğini; teknolojik erişim, davranışsal eğilimler ve sisteme duyulan güven gibi bağlamsal faktörlerin daha belirleyici olabileceğini işaret etmektedir.

Anahtar Kelimeler: Finansal Okuryazarlık, Dijital Finansal Okuryazarlık, Dijital Finansal Kapsayıcılık, Dijital Finansal Hizmetler, Finansal Bilgi.

ABSTRACT

MULTIDIMENSIONAL FACTORS AFFECTING DIGITAL FINANCIAL LITERACY: THE CASE OF CAMEROON

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With the digitalisation of the global financial system, Digital Financial Literacy (DFL) has become a critical competency for financial inclusion and sustainable development, particularly in developing economies such as Cameroon. This study aims to identify the factors influencing individuals' multidimensional digital financial literacy levels using the example of Cameroon and to fill the existing gap in the literature. A quantitative research method was adopted in the study, and data were collected using a survey technique from 662 participants, consisting of university students and microfinance customers, between December 2024 and February 2025. The data obtained were tested using factor analysis, variance analysis, and multiple regression models using the IBM SPSS statistical programme.

Contrary to general expectations in the literature, the findings of the study revealed that socio-demographic variables such as age, gender, education level, income, and occupation were not statistically significant predictors of participants' digital financial literacy levels. The results of the factor analysis confirmed that the concept of DFL cannot be reduced to a single dimension, but rather exhibits a multidimensional and complex structure.

In conclusion, this research demonstrates that digital financial literacy in the Cameroonian context cannot be explained solely by demographic characteristics. The findings indicate that policies aimed at increasing financial literacy must go beyond demographic targeting; contextual factors such as technological access, behavioral tendencies, and trust in the system may be more decisive.

Keywords: Financial Literacy, Digital Financial Literacy, Digital Financial Inclusion, Digital Financial Services, Financial Knowledge.



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ABBREVIATIONS

FL	Financial Literacy
DFL	Digital Financial Literacy
DFS	Digital Financial Services
DFI	Digital Financial Inclusion
SME	Small and Medium-sized Enterprise
ICT	Information and Communication Technology
KYC	Know Your Customer
AML	Anti-Money Laundering
API	Application Programming Interface
UI/UX	User Interface / User Experience
OECD	Organisation for Economic Co-operation and Development
AFI	Alliance for Financial Inclusion
SDGs	Sustainable Development Goals
GSMA	Global System for Mobile Communications Association
MFI	Microfinance Institution
CBDC	Central Bank Digital Currency
P2P	Peer-to-Peer
SLR	Systematic Literature Review
R²	Coefficient of Determination (used in regression analysis)
DFSI	Digital Financial Services Infrastructure
UX	User Experience
AI	Artificial Intelligence
UNDP	United Nations Development Programme
IMF	International Monetary Fund

TKBB	Türkiye Katılım Bankaları Birliği (Participation Banks Association of Türkiye)
INFE	International Network on Financial Education
MTN	Mobile Telephone Network
M-Pesa	Mobile Payments Service (originally “M” for mobile and “Pesa” meaning money in Swahili)
ROI	Return on Investment
DFLC	Digital Financial Literacy Competency
ISIF	Inclusive Sustainable Financial Inclusion Framework
PLS-SEM	Partial Least Squares Structural Equation Modeling
COBAC	Commission Bancaire de l'Afrique Centrale (Central African Banking Commission)
CrossRef	Cross Reference

INTRODUCTION

The global integration of financial markets and the increasing level of complexity within the economic landscape have, since the late 20th century, highlighted Financial Literacy (FL) as a fundamental component of economic stability. Large-scale economic upheavals, such as the Great Depression of 1929 and the Global Financial Crisis of 2008, demonstrated that beyond institutional regulations, the level of knowledge individuals possess regarding financial products and risks is vital for macroeconomic resilience. During these periods, consumers were the most vulnerable to the shock waves of crises, revealing that a lack of financial knowledge among consumers and financial professionals often served as a genesis for such instability. Recognizing this, international organizations, particularly the OECD, have prioritized financial education as a key policy agenda to enhance financial well-being. Financial literacy plays a key role in achieving goals such as improving household welfare, making informed savings and investment decisions, and securing retirement planning.

However, in the 21st century, the rapid pace of technological advancement and digital transformation has radically reshaped the concept of financial literacy. Financial Technologies (FinTech), emerging as one of the greatest innovations of the digital age, have fundamentally altered the way banking and financial services are delivered. With the proliferation of smartphone penetration, tools such as mobile banking, electronic payment systems, cryptocurrencies, blockchain technology, and AI-supported investment advisories (robo-advisors) have surpassed traditional banking services and entered the lives of millions. Notably, the recent COVID-19 pandemic necessitated a mandatory digitalization, forcing a significant portion of financial transactions onto online platforms. This shift compelled individuals to develop "Digital Financial Literacy" (DFL), a competency requiring high-level technological skills and cybersecurity awareness in addition to financial knowledge. DFL encompasses not only access to digital tools but also the ability to use these tools securely, ethically, and effectively, manage digital risks, and protect against online fraud attempts.

One of the most critical areas requiring investigation regarding this global transformation is the context of developing economies. Cameroon, which constitutes the

focus of this thesis, aims to become an emerging economy under its "Vision 2035" framework and views financial inclusion as a strategic tool to reach this goal. High rates of mobile phone usage and the prevalence of mobile money transactions in the country have significantly expanded access to financial services. This situation creates a significant opportunity for financial inclusion for populations living in rural and underserved regions where physical banking infrastructure is insufficient.

Nevertheless, the increase in access to digital financial services in the Cameroonian economy has brought about serious challenges stemming from a lack of DFL. Research indicates that formal bank account ownership in Cameroon remains below the Sub-Saharan Africa average, and a significant portion of the population continues to rely on "Tontines," which are traditional, informal, and high-risk savings groups. This reliance suggests that individuals either lack trust in modern financial tools or possess insufficient knowledge and skills to manage the complex structure of these instruments. While financial exclusion is expected to decrease with digitalization, low levels of DFL leave individuals deprived of the benefits offered by new financial products and render them vulnerable to risks such as digital fraud and identity theft.

The "Urban-Rural Disparity" observed in Cameroon's economic structure stands as one of the major structural barriers to the spread of DFL. While digital adaptation rates are high in major urban centers, rural areas are forced to contend with obstacles such as inadequate infrastructure, low education levels, and limited internet access. Furthermore, socio-demographic factors such as gender, age, and income are of critical importance for the accurate targeting of policy and education strategies regarding their potential impact on DFL. In this context, the primary research problem of this thesis is to empirically determine the multidimensional factors affecting digital financial literacy levels in the context of Cameroon and to identify the relative importance of these factors.

Although there are extensive studies in the literature on factors affecting financial literacy, empirical studies that handle DFL with a multidimensional perspective beyond traditional factors (incorporating technological skill, cybersecurity awareness, and cultural norms) and focus on the specific conditions of Cameroon are identified as limited. This thesis aims to fill this gap in the literature. In line with these objectives, the study is organized into the following chapters:

Chapter 1: This chapter presents the theoretical origins and historical development of the concept of financial literacy in detail. The definition of financial literacy, its dimensions (knowledge, attitude, behavior), and its importance at micro and macro levels are scrutinized within the framework of international standards and global organizations such as the OECD and the World Bank.

Chapter 2: The focus shifts to the concept of Digital Financial Literacy (DFL). The aspects distinguishing it from traditional financial literacy, the multidimensional components of DFL (digital knowledge, digital skills, security awareness), and the transformative effect of digitalization on financial behaviors are discussed.

Chapter 3: The current Financial Technologies (FinTech) ecosystem is examined from technical and functional perspectives. Innovative tools such as mobile banking, cryptocurrencies, blockchain technology, AI-based services (Robo-advisors), and digital insurance are explained in detail, revealing the relationship between these tools and DFL.

Chapter 4: This chapter contains the empirical application of the study. The methodology of the field research conducted in Cameroon, the survey development process, and data collection methods are explained. In light of the collected data, the effects of demographic and other factors on digital financial literacy are presented through factor analysis, ANOVA, and multiple regression analyses.

The findings obtained are evaluated and interpreted within the context of the study's general purpose and the literature. In this section, the theoretical and practical contributions of the research are summarized, concrete recommendations are made for policymakers and financial education providers, and suggestions for future studies are presented.

CHAPTER 1: FINANCIAL LITERACY

1.1. CONCEPT AND HISTORICAL DEVELOPMENT OF FINANCIAL LITERACY

FL has been a dynamic concept where it is seen as multidimensional concept made up of, financial knowledge, attitudes and behaviors which leads to a good financial decision making. The President's Advisory Council on Financial Literacy (PACFL), has defined this concept of FL as “ the ability to use knowledge and skills to manage financial resources effectively for a lifetime of financial well-being.” (PACFL, 2008). From this definition we understand that this concept is a combination of both the understanding information and practical application.

That is why Huston (2010) further redefined the concept and added two more important dimensional framework: the **Financial Knowledge** and **Financial Application**. According to him, FL should not be viewed as the possession of financial information and to have the capability to put in practice that knowledge in real-life financial contexts. This idea aligns with other approaches that emphasize behavioral outcomes, like budgeting, saving, investment, and debt management.

FL can also be seen on other perspective as the capacity to comprehend and to apply financial skills, including personal money management, budgeting, and investing. FL become popular in the latter half of the 20th century. This was the period when the global economies transitioned toward consumer-oriented models (Bonyushko & Semchenko, 2023).

In the global level, the need for FL has increased as a result of increase in the variety of financial products and services available in the economy. The OECD in the year 2018 reported that just;- “52% of adults across 26 countries could correctly answer 5 out of 7 FL questions.” (Dube, 2018). The result demonstrated acknowledge gaps in emerging economies where financial inclusion is still developing e.g in the Sub-Saharan African region, the average financial literacy rate is approximately 35%, according to a World Bank survey. Hruška et al., (2023).

1.1.1. Historical Development

To begin with, FL has been a dynamic concept over time. It has changed from the fundamental financial knowledge to a more comprehensive understanding of personal financial management. The way and time when FL came to existence was when the industrialized nations responded to increasingly diverse financial products in the early 20th century which was also marked by the rise of consumer credit (Radzi et al., 2023). This came as a result of the lessons learned from the Great Depression which was marked by of poor financial management prompting greater emphasis on financial education.

FL later on became almost part of life by the mid-20th century. This was as a result of the growing need for financial tools like credit cards and mortgages which was triggered by growing consumerism and the proliferation (Islam et al., 2022). Also, the 2008 global financial crisis was also seen as a junction where by the governments and institutions began promoting financial education that are mostly focused on knowledge, behavior and attitudes (Koçoğlu, 2021).

As a result, presently, the need for the savvy of budgeting , savings, investment and the management of debt is primordial for FL. Which in effect, will require the different aspects of financial decision making in a digital world (Bose & Basu, 2021). The coming into play the different digital platforms & crypto-currencies has increase another barriers or challenges.

Nevertheless, given the importance of FL, the global rate remains relatively low with studies suggesting just about 33% of adult in the world are financially literate (Mian, 2014), and some reports suggests that in Indonesia the general adult FL is below 50%, indicating the need for more educational efforts on FL. Riwaya et al., (2023).

1.2. THE IMPORTANCE OF THE CONCEPTS OF FL

Owing to the dynamic situation of the global economy and especially in the financial sectors, and also haven seen the changes in the pension system, haven seen the increase in the generative diverse financial tools such as the cryptocurrency, haven being touched by the hit of global inflation, haven been trembled by the gravity of geopolitical conflicts and wars like that of Ukraine and the war in Palestine on Gazza while also not forgetting the issue of Global Climatic Change, haven seen all of these factors, it is to the interests of nations, communities and individuals who have a clear conscience and visions towards it developments to come to its senses and put the knowledge of FL as fundamental tool so as to build up a shield and put on a fight to counter these dynamic phenomenons, which as a result lea to an over all well being. That was not by coincident that the OECD's 2020 recommendations on FL identified financial well-being as the main aim to financial education. Lusardi, A., & Messy, F.-A. (2023).

1.2.1. The Importance Of FL For Individuals

To an individual, FL has a very important part to play vis-a-vis other economic institutions for the individual's financial and health benefits.

According to Lusardi, A., & Messy, F.-A. (2023), FL could enhance the participation of financial markets and the savvy use of financial instruments. For example, there have been a global call for the promotion of FI especially at the G20 countries. This comes as a results of the inability to reach to basic financial assets like bank accounts and especially to stock markets and financial market by the larger proportion of the population. As result of financial markets becoming more dynamic and complex, taking advantage of new investment opportunities can help reduce inequality (Lo Prete 2013) and can as well promote competition in the global market.

Pension knowledge or literacy can help people for their retirement benefits especially those that live longer than their husbands and they don't also have access to the

job market for child caring and upbringing. And there is also house chores.as study shows the level of pension literacy is low among women and that can affect their retirement scrutiny. Lusardi, A., & Messy, F.-A. (2023).

Lets take an example of the U.S.A where a program was taken to sensitize the community especially the low income class on the dependence on high-cost borrowing options like payday loans (Krechovská, 2015). this is to say that FL initiatives enhances financial behaviors. These efforts showed the role of the FL in the promotion of social equity. This will come as a result of giving the undeserved individuals with the essential knowledge they will be in need to make informed financial decisions.

1.2.2. Importance Of FL For Financial Systems

In emerging nations and economies, the banking system has a set back on the improvement of living conditions and also helping in social cohesion or participate in economic development. This actions are not just for market strategy but that makes the uniqueness of a bank against other financial institution. Fatoki, O., & Chigamba, C. (2011)

FL is vital for both consumers and financial institutions. As for the individuals or consumers, sound knowledge on financial services is needed so as to make a good financial decision. On the other hand, Financial institutions need to provide to consumers the essential knowledge leading to making good decisions. This makes them maintain confidence in the market as it for the former an important strategy to protect consumers. World Bank. (2012)

In a study by made by Rohrke and Robinson (2000), they stipulated that teaching and orientating consumers on the importance of working with financial institutions for credits funding and investments is through FL.

And according to Hailwood (2007), FL will affect the way people make borrowings, savings, manage finance and investing. It is also imperative to have the

knowledge of FL so as to have the basics on economic and financial to make application of them.

1.2.3. Importance Of FL for Countries

Moreover, FL is the backbone of economic development as a result, it strengthens the interrelation of individuals, financial system and the state. Its merits en-globes the well being and stability of Microeconomic agents in particular (individuals and financial institutions) and the development of the Macro-economy (country) as a whole.

According to (Zaimovic et al., 2023), a population made up of those who have high level of FL has the tendency to participate in the growth of the macroeconomic of scale of a country by supporting an efficient market and the allocation of resources.

This is the case in Europe, where research was done and the result stated that countries in the European region with citizens having high FL turn to have a stable financial market. This is as a result of the ability to understand and participate in diverse and complex financial market like stock investment markets and also to plan well for retirement. (Finke & Huston, 2014).

1.3. THE DIMENSIONS OF FINANCIAL LITERACY

FL is widely recognized to be a multidimensional construct, encompassing cognitive, affective, and behavioral components. According to Atkinson and Messy (2011), the three core dimensions of FL are; the *financial knowledge*, *financial attitude* and *financial behaviors*. The combination of these dimensions makes an individual make an individual take part in the complex financial world and make good decisions.

1.3.1. Financial Knowledge

Financial Knowledge can be defined as having basic knowledge on the primary conceptions on finance to be used day to day for financial transactions such as investment, inflation, credits etc.. and also having the knowledge on banking activities like e-payments, saving accounts, internet banking etc. Having basic FL knowledge will lead to the knowledge of essential financial concepts. (OECD, 2013). That is why Huston (2010) suggested that Financial knowledge is the back bone of FL. Radzi, N. A. M., Haron, N., Saidi, N. A., & Abdul Rahim, H. H. (2023)

However Bucher-Koenen et al., (2016) considers Financial Knowledge to be a synonym of FL. And according to Huang, Nam and Sherraden, (2013), it is the comprehension of Financial concept to an individual. Nevertheless, FL is the combination of competence and ability and it should be noted that Financial knowledge differs from FL.

People with sound Financial knowledge are able to evaluate financial products like investments and also compare them and avoid making mistakes. (Lusardi & Mitchell, 2014). and other study says having financial knowledge improves financial behaviors leading to financial well being. (Falahati, Sabri & Paim, 2012).

1.3.2. Financial Attitude

Financial attitude is a persons beliefs, a persons values, and psychological disposition in regard to decisions on finance and money. It influences how people perceive financial risks, prioritize financial goals, and respond to financial challenges.

A good and sound financial attitude is always known by planning, goal-setting, and a long-term orientation toward financial well-being (Sesini & Lozza, 2023). Attitudes are shaped by cultural norms, family upbringing, education, and personal experiences. Financial attitude is like a linking bridge between knowledge and behavior, which

motivates individuals to apply what they know e.g someone who views saving as a responsible and empowering act is more likely to consistently set aside money, even with limited income.¹

1.3.3. Financial Behavior

This is all about how a person manages his or her fund like the way of spending ,how much he serves, when and how he borrows, and on investment as well. (Sudindra & Naidu, 2018). Some studies suggests that it entail the daily spending on bills, purchases and others. Bajaj & Kaur, (2022). However these behaviors are not constant as they vary from person to person and from time to time as a result of external and internal factors like family guidance, friends, marital status and or income level. (Gokhan & Mutlu, 2019).

To say also, that studies stated that financial knowledge and a locus of control have a very important role to play in determining financial behaviour. While on the hand, income does not exert a strong influence (Arifin, 2017). To conclude, from these authors, financial behaviour is seen as a multidimensional concept which is shaped more by psychological and social factors other than economic alone. (Arifin, 2017).

Financial behavior is been affected by FL in many ways. A persons financial actions dependents on his or her level of FL knowledge, (Lown et al., 2015) and studies also show how it influences the behavior of a student. (Susanti, Palupi & Hamidah, 2022), because students with FL have short term decision skill. However their confident and action in here can still be inaccurate (Paskelian et al., 2019). FL can still enhance saving, and spending, and also short- and long term plan habits (Zulaihati, Susanti & Widyastuti, 2020). Theory of Planned Behaviour has been used to better understand these behaviors (Ajzen, 1991). Individual point of view on personal finance could further shape the financial behaviour in this framework (Goyal, Kumar & Xiao, 2021).

¹ This reflects the main characteristics of “Tontine” which will be seen in the subsequent chapter 4 of this research.

1.4. FACTORS AFFECTING FINANCIAL LITERACY

In the meantime, FL plays a significant part in the financial well being. As researches deepens, it is critically analyzed that it is being affected or influenced by the multi-demographic elements in the emerging and emerged economies or countries around the world.

When referring to age among other demographic factors, reports suggests that adults have a low FL level (OECD, 2020), also, men are reportedly being more financially savvy (knowledgeable) and also financially well-being than the female counterpart. And to talk more, it is also reported that the young age adults have a low level of FL score, financial attitude score, knowledge and also financial behaviour than the adult population.

In addition, many other researchers like Bajo et al.(2015), Garg and Singh (2018), Bawre and Kar (2019), Klapper et al. (2015), and Bhushan and Medury (2013) carried out studies on how FL influences income. And they suggested the effects of socioeconomic factors on the level of FL with only Kim and Mountain (2019) that reported that FL has no influence on income.

At the same time, resarchers like Garg and Singh (2018), Cucinelli et al. (2019), and Dogra et al. (2021) instead orientated their research towards the dimensions of FL like Financial Attitude, Financial Knowledge, and Financial Behavior and on how they influence FL

And on the other hand, Dewi et al. (2020) suggested that the level of FL is affected by 8 critical variables which are;- skills, Goal, Capability, Behavior, Knowledge, experience, Decision and lastly Financial awareness.

And lastly, other reports suggests that the level of FL on aspects like tolerance and risk levels are being moderated by demographic factors like sex, age, income level, and marital status. Hendrawaty et al. (2020)

1.5. FINANCIAL LITERACY IN THE WORLD

According to the OECD (2022), FL is made up of the essential financial consciousness, understanding, capabilities, perspectives, and the conducts that is also required for making a carefully monetary choices and attaining financial wellness. As such, this skill helps to empowers people to make well and informed economic decisions while gaining enhanced authority over their personal finances. Also, it equips individuals with the ability to recognize and circumvent fraudulent financial schemes, while building their confidence to explore emerging dimensions of the financial sector. Furthermore, financial literacy promotes the practice of saving and investing, which is enabling people to handle temporary variations in earnings and accomplishing their extended financial objectives.

It is clearly understood that FL is becoming a global concern where it ignores borders, income level and also education levels. Hence, it is of prior important in the empowering of individuals in risk management, financial decision making so as to have a financial well-being in the long run.

This section explores the global landscape of FL using data from the OECD/INFE International Surveys, the World Bank's Global Findex Database, and the S&P Global FinLit Survey.

1.5.1. Global Level of Financial Literacy

1.5.1.1. *OECD/INFE International Financial Literacy Surveys*

The OECD/INFE 2023 Survey assessed financial literacy across 39 nations and economies, which also including 20 OECD member states. It measured three core dimensions:

- * *Financial Knowledge*
- * *Financial Behaviour*
- * *Financial Attitudes*

According to the OECD/INFE (2023) Survey, the average FL score across participating countries and economies is 60 out of 100 points, with OECD countries averaging 63. Financial knowledge scores are slightly higher, averaging 63 globally and 67 in OECD countries. While a majority of adults understand basic concepts such as inflation (84%) and the risk–reward relationship (77%), fewer can apply more complex principles, with only 63% able to use the time value of money and 42% correctly answering questions on compound interest. Even among savers, just 46% demonstrate an understanding of compound interest. Financial behavior scores average 61 globally and 62 in OECD countries, with 70% of adults considering affordability before purchases, though only 26% compare products across providers and 24% seek independent advice. Financial attitudes score lowest, averaging 56 globally and 58 in OECD countries, with higher education, income, and employment positively associated with financial literacy. Overall, 63% of adults holding financial products fail to meet the minimum target score of 70. Additionally, 15% of adults report experiencing financial fraud or scams, such as phishing, identity theft, or unauthorized transactions, and two-thirds of fraud victims score below the minimum literacy threshold, highlighting the link between low financial literacy and vulnerability to fraud. Figure 1.1 and figure 1.2 below shows the global FL of adults across many nations.

Average financial literacy scores (out of 100)

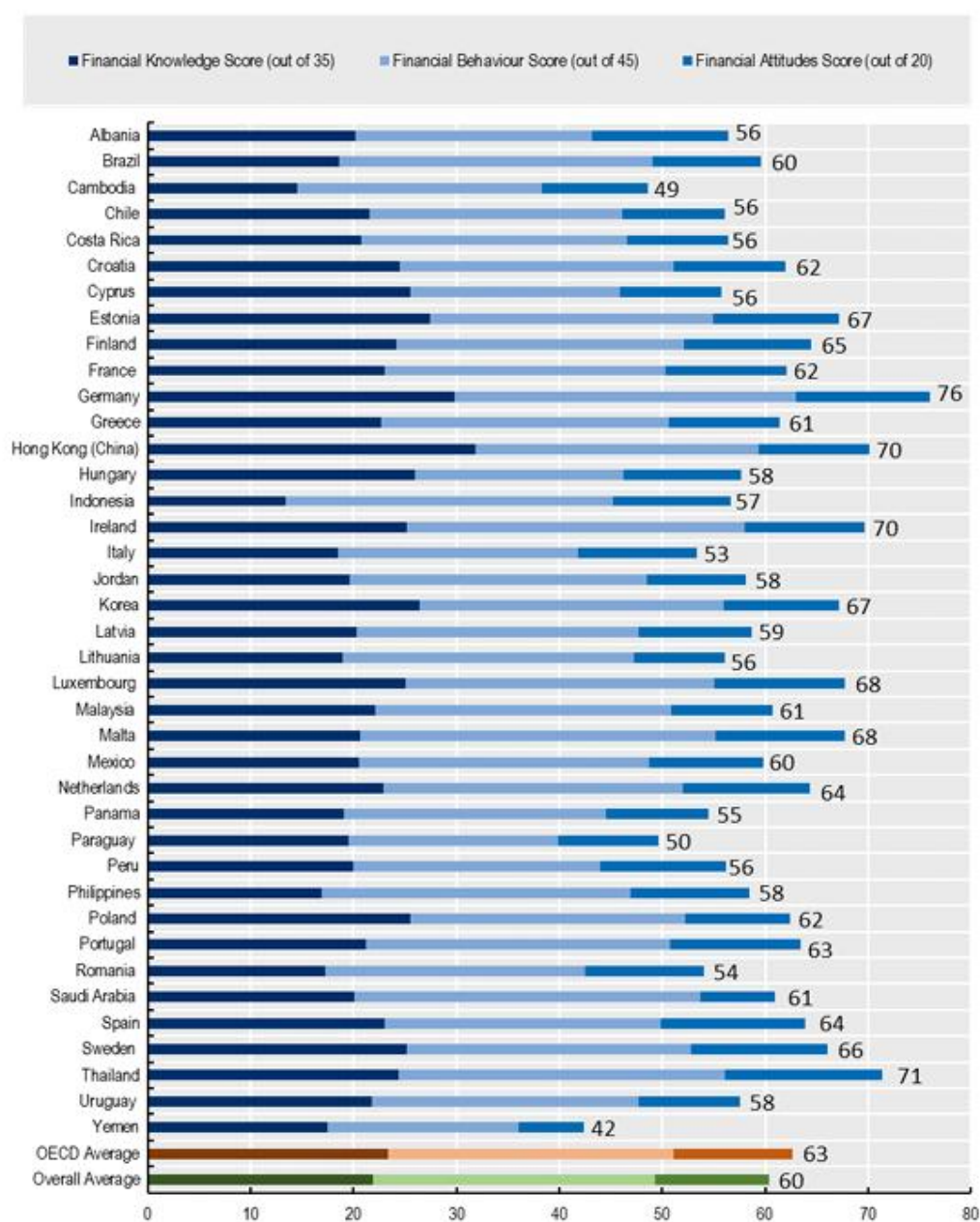


Figure 1.1. Global Financial Literacy

Source: OECD/INFE 2023 Survey of Adult Financial Literacy.

Percentage of adults who obtained the minimum financial knowledge score (correctly answering at least five out seven financial knowledge questions)

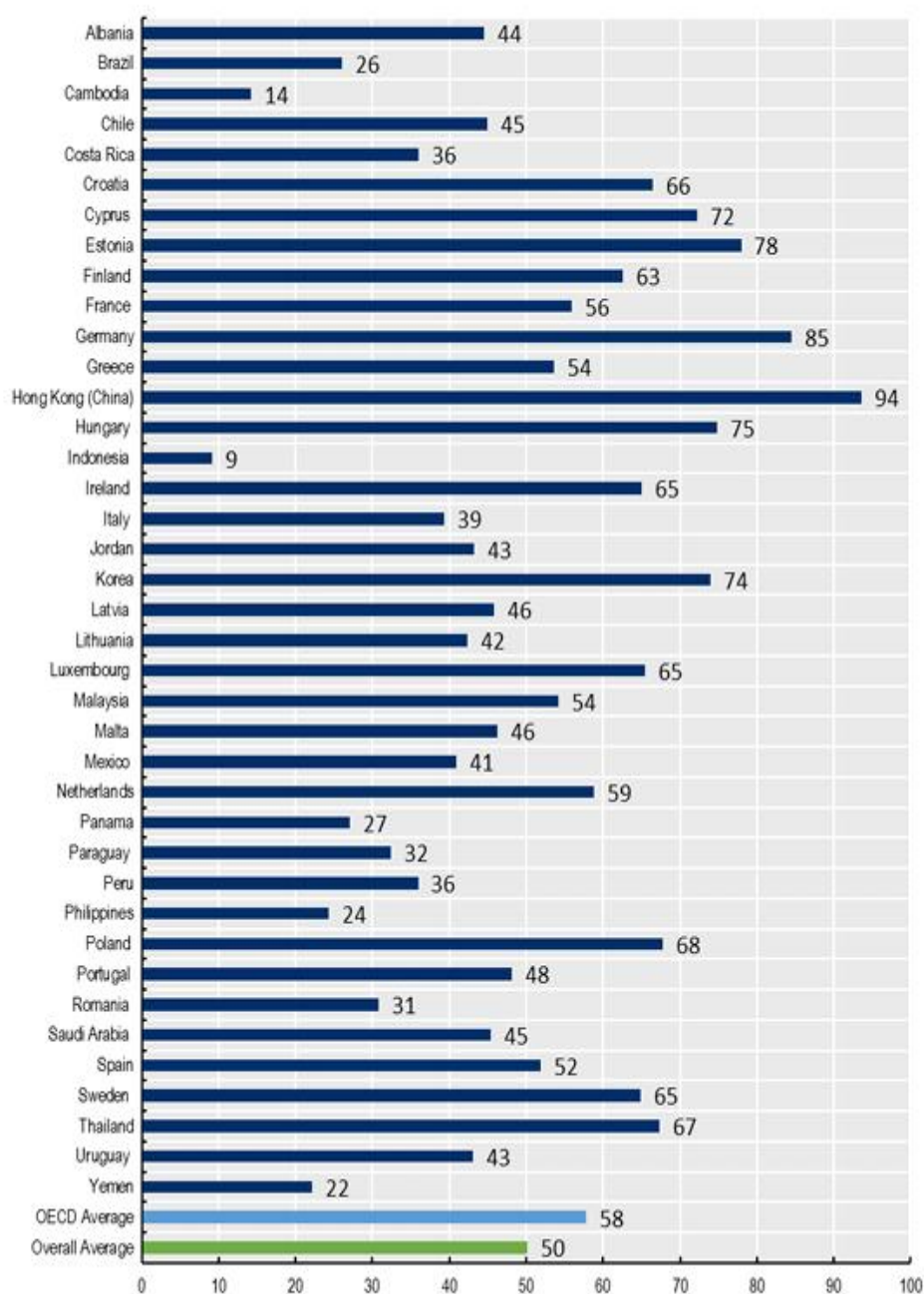


Figure 1.2. Percentage Of Global Financial Literacy

Source: OECD/INFE 2023 Survey of Adult FL.

According to the survey, the FL levels of the countries and economies that participates in the activity are all analyzed using 7 critical questions which leads to the

understanding of financial decision making. As such, they measured concepts like investment and saving in the long run, rates of interest, inflation rates, management of risk, and the value of money with time.

As for the scores of the questions, they were being evaluated using just the correct response and which had the scale of 0 - 7 and later on re-scaled to 0 - 100 where a greater financial knowledge is determined by the highest score.

It showed the average FL score in the participating countries and economies where the adult part of the survey showed a relatively minimum and low target score and also the proportion of the adult population that correctly answered the each of the FL questions.

1.5.1.2. The Levels of Financial Knowledge

According to the survey, there was a varying level of the level of financial knowledge or literacy in the participating countries and economies. Where in the average, adults who scored 63 points out of 100 points were observed, as the member countries of the OECD having 67 on the average.

And meanwhile, countries like Germany with 85, the city of Hong Kong in China 91 and Estonia with 78 having the highest score level on the financial knowledge. On the survey, the minimum target of financial knowledge level was observed where it indicates that adult proportion answered at 5 of the 7 questions on financial knowledge and that was the minimum threshold for the determination of the level.

1.5.1.3. Financial Behaviour

The actions of individuals directly or indirectly influence the situation of their financial well-being and finances both in the long and short run. Behaviors like bill payment delays, lack of comparison on financial products before engagements and or planing for future in terms of returns or retirements lead to an unfavorable outcomes on their financial status. OECD/INFE (2023).

As such, on the survey, 9 critical questions were included on whether the participants have a good knowledge on FL to determine their financial behavior levels. These practices involve the ability to keep the track of money flow, like;- personal financial observations, arrears avoidance and bills payment on time - and the planning in the long-run and saving like;- setting-up a long term financial project, active savings - and the management of short term financial constraints like;- seeking for personal financial counselling, the comparison of diverse financial options and to shop around for financial products. The financial behavior scores were obtained by attributing “financially savvy” to the positive responds which were scaled from 0 - 9 and later on re-scaled to 0 - 100 where the highest score represented a stronger financial behavior.

The survey as seen in figure 1.3 below demonstrated an average score in the participating countries and economies where the adult population having the lowest score while demonstrating correctly each behavior.

1.5.1.4. Levels Of Financial Behaviour

The figure 1.3 below shows the results of the global percentage of adults who obtained the minimum target financial behaviour score.

Percentage of adults who obtained the minimum target financial behaviour score (displaying at least six out of nine financially savvy behaviours)

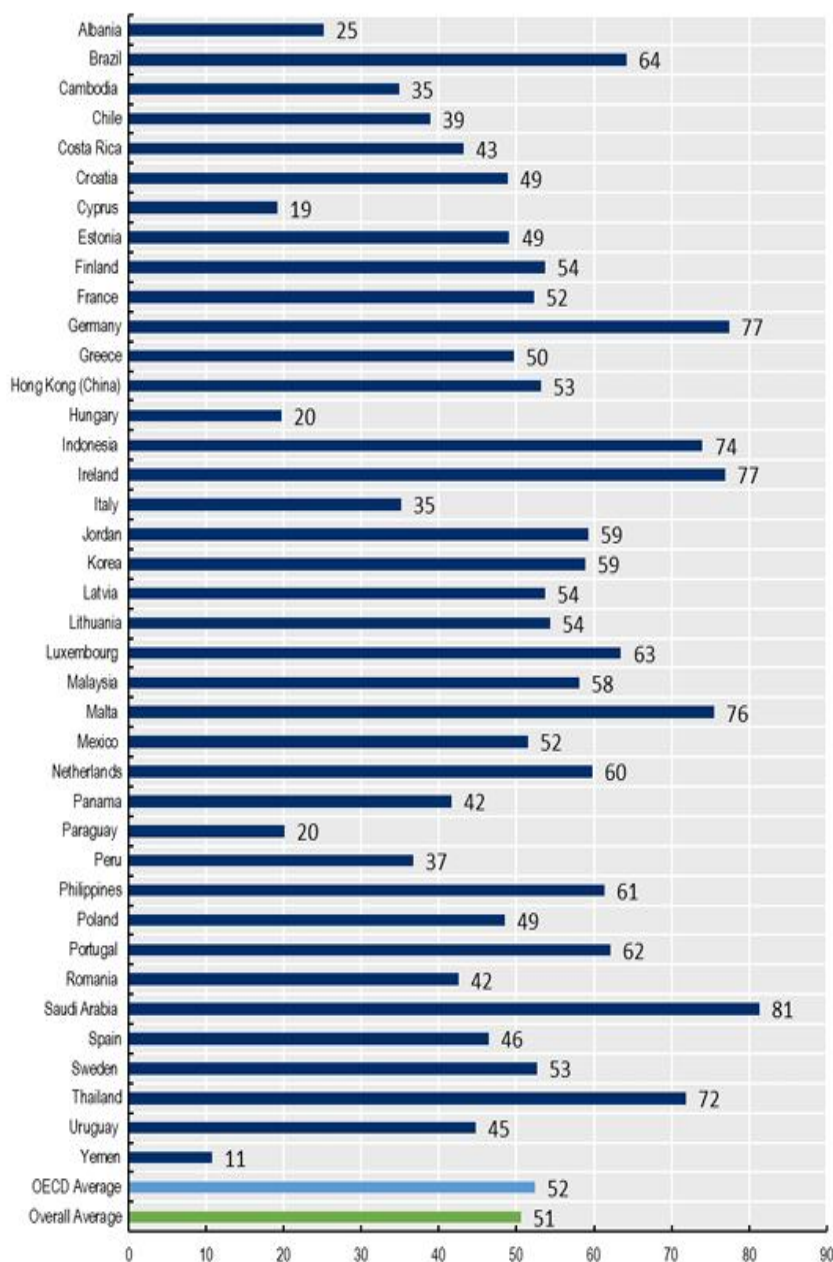


Figure 1.3. Percentage of Global Financial Behaviour

Source: OECD/INFE 2023

Figure 1.3 above shows the OECD/INFE 2023 survey results where it shows a considerable variation in the financial behavior of the countries and economies participating respectively. It suggests that on the average, adults had scored 61 / 100

points, and the OECD member countries having an average of 62%. To have demonstrated a highest financial behavior score means answering at least 6 / 9 financially literate behaviors questions. It further demonstrated that 51 % of the adults in the took part in the survey activity (in the counties and economies) had a minimum target as compared to the adults in OECD countries with 52 %. The research showed a difference in financial behaviour both within and across economies and proposing the importance of assessing behavioral dimensions of FL.

1.5.1.5. Financial Attitudes

According to the OECD/INFE (2023) Survey, “financial attitudes represent the third component of financial literacy, The OECD definition acknowledges that, beyond knowledge and ability, individuals’ attitudes toward money significantly influence their financial decisions and behaviours. To assess this dimension, the survey included a set of questions designed to measure respondents’ perspectives on money management and future planning. These items focused particularly on short-term preferences, such as “living for today,” and asked individuals to indicate on a scale the extent to which they agreed or disagreed with statements reflecting attitudes toward spending and saving”.

1.5.1.7. Responses To Individual Financial Attitudes Questions

- 1• *“I find it more satisfying to spend money than to save it for the long term.”*
- 2• *“I prefare to live for today and let tomorrow take care of itself.”*
- 3• *“is there Money spent.” (optional)”* OECD/INFE (2023)

According to the OECD/INFE (2023) Survey, financial attitudes were measured to assess individuals perspectives on money management and future planning. Short-term preferences, such as prioritizing immediate spending, were identified as potentially harmful to financial resilience and long-term well-being. Respondents indicated their level of disagreement with statements reflecting short-term orientations, and average scores were calculated from two attitude questions, rescaled to a 0 -100 scale. Higher scores represent more financially literate attitudes. This is illustrated on the figure 1.4 below.

Percentage of adults who display long-term financial attitudes

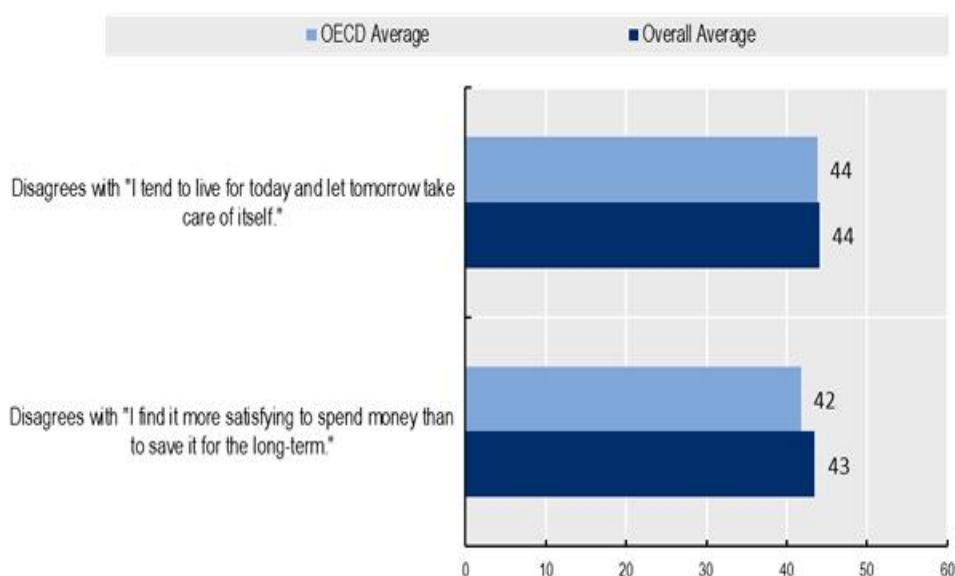


Figure 1.4. Percentage of Global Level Of Financial Attitude

Source: OECD/INFE 2023 Survey of Adult Financial Literacy.

The survey includes three financial attitude questions designed to assess individuals' orientations toward short-term spending versus long-term financial planning. One of these questions was optional and therefore was not taken into account to analyse the financial attitudes score. The evaluation indicates that among the average of the regions that took part in the survey exercise, not up to half (i.e., 44%) disagreed with the statement saying :- "I tend to live for today and let tomorrow take care of itself." Similarly, 43 % of adults disagreed with the statement:- "I find it more satisfying to spend money than to save it for the long-term." Because the statement "Money is there to be spent" was optional and not asked in many countries, it was not included in the overall financial attitudes score. These findings suggest that fewer than half of adults across OECD and participating economies demonstrate long-term financial attitudes.

1.5.1.8. Financial Literacy Levels Across Socio-Demographic Groups

According to the the above Survey, both FL and its components do not correlate across the individual level characteristics, including the demographics (age, gender, education, labour force status, and income). The report presents differences in financial

literacy & levels associated with these factors, considering them simultaneously across participating countries and economies. Detailed results are provided in 1 and1, which outline variations in financial knowledge, behaviour, and attitudes scores by these demographic characteristics. This is shown on figure 1.5 below.

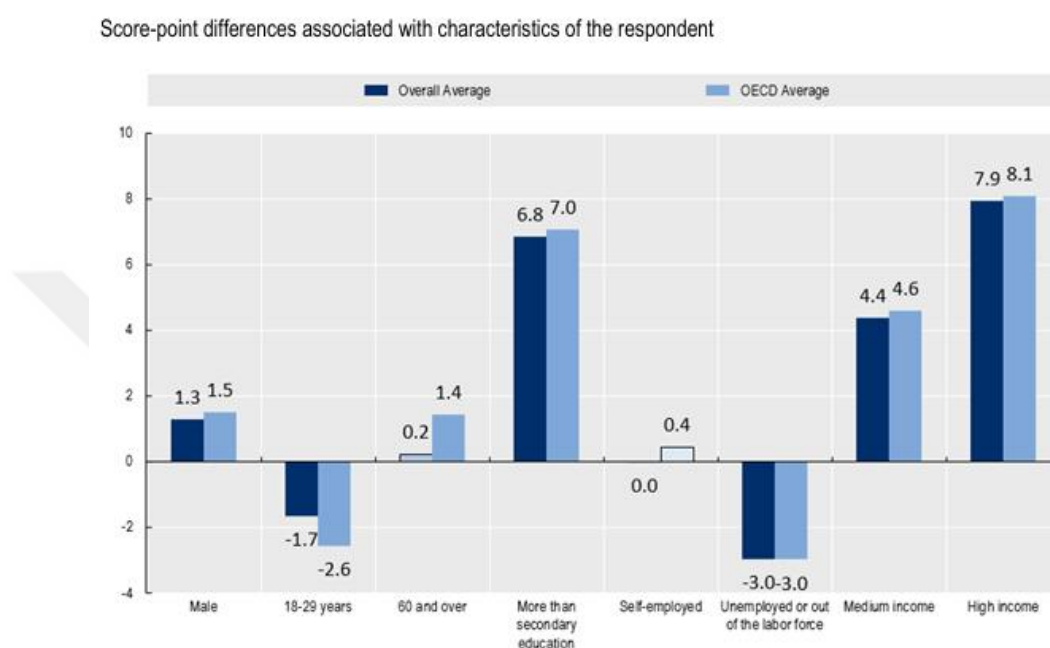


Figure 1.5. Global FL Across Socio-Demographic Groups

Source: OECD/INFE 2023 Survey of Adult Financial Literacy.

Notes: The results were derived using ordinary least squares (OLS) regression, applying sampling weights where available for each country or economy. This analysis compared the results in specific groups, taking into consideration women, individuals with ages 30 - 59, respondents with upper secondary education levels or below, employees, and those with low incomes. Statistically significant differences were highlighted in darker colours at the 5% significance level. OECD/INFE, (2023)

1.5.2. Global Best Practices In Financial Literacy

The Global Financial Crisis 2008 marked the need of FL and its capability, as limited consumer knowledge contributed to the crisis. To part of the financial sector, individuals had to be aware and have a good understanding of the increasingly diverse financial product and their risk risks like fraud and over-indebtedness.

As such, many countries have implemented targeted financial education programs designed to improve consumer decision-making and avoiding negative outcomes. These initiatives range from national strategies & literacy campaigns to put in place seminars and educational activities, getting diverse populations through multiple delivery channels to participate.

Given that evaluations of these programs have produced mixed results regarding their effectiveness and cost efficiency, evidence suggests that well-designed, tailored interventions can yield positive short-term impacts. Hence, policymakers (governments) continue to support financial education as a potentially valuable instrument for strengthening consumer capability and to make sure that the functioning of financial markets is made with ease.

1.5.2.1. Summary Of OECD Principles And Good Practices For Financial Education And Awareness.

The key principles outlines promoting financial capacity building, tailoring programs to national circumstances, integrating financial education into administrative and regulatory frameworks, & encouraging financial institutions to provide advice and awareness. Good practices shows the importance of public action, including national campaigns, early financial education in schools, integration into welfare programs, accessible online resources, & international cooperation.

Hence Financial Institutions are encouraged to provide clear, non-commercial information, ensure comprehension, undergo independent evaluations, and train staff in financial education. Specific attention is given to retirement savings, with institutions expected to educate individuals in personal pension plans and employees in occupational schemes. Broader programmatic practices include fostering consumer understanding of financial services, promoting research in behavioral economics, developing evaluation methodologies, designing content guidelines, utilizing diverse media, targeting different population segments, and training educators for classroom-based initiatives. However this can be seen in figure 1.6 below.

Country	Focus	Target Group	Intervention Type	Evidence of Effectiveness
Australia and New Zealand	Remittances, credit, and financial product selection	Migrant workers	Seminar	Mixed results
Brazil	Budgeting, savings, and general financial management	High school students	Classroom training	Yes
<i>Brazil</i>	<i>Stock market investment</i>	<i>Stock market users</i>	<i>Online stock market simulator</i>	<i>-</i>
<i>Dominican Republic</i>	<i>Financial management</i>	<i>CCT beneficiaries</i>	<i>CCTs and seminars</i>	<i>-</i>
India	Budgeting, savings, and general financial management	Low-income households	Seminar	Mixed results
<i>India</i>	<i>Savings, budgeting, financial product selection</i>	<i>Low-income households</i>	<i>Seminar, counseling, SMS reminders</i>	<i>-</i>
India and Kenya	Long-term planning, and weather insurance	Rural small-scale farmers	Comic books	Mixed results
Kenya	Financial management, and savings	School children	Classroom training, comic books, and radio shows	No
<i>Malawi</i>	<i>Financial management, and savings</i>	<i>Agricultural wage earners and farmers</i>	<i>Labeled banking account, Behavioral economics</i>	<i>-</i>
Mexico	Savings, retirement, and use of credit	Credit card customers	Seminar	Mixed results
<i>Mexico</i>	<i>Savings, and credit</i>	<i>Low-income credit customers</i>	<i>Disclosure formats, SMS and phone counseling</i>	<i>Yes*</i>
Nigeria	Savings, use of banking services	Existing and new bank users	Marketing campaign	Mixed results
<i>Nigeria</i>	<i>Savings, credit</i>	<i>Low-income households and small business owners</i>	<i>Movie</i>	<i>Mixed results*</i>
<i>South Africa</i>	<i>Savings, remittances, budgeting, and financial product selection</i>	<i>Members of burial societies, Women's development groups</i>	<i>Seminar</i>	<i>Yes*</i>
South Africa	Debt management	Low-income households	Soap opera	Yes
Uganda	General financial education	Low-income households	Seminars	Mixed results
<i>Uganda</i>	<i>Vocational and business training</i>	<i>Small business owners</i>	<i>Seminars</i>	<i>Mixed results*</i>
Nigeria	Microsavings	Entrepreneurs	Movie	Yes

Figure 1.6. Summary Of Complete And Ongoing Financial Education Studies.

Source: World Bank, (2014)

* Preliminary results only

- Ongoing Evaluations are presented in italic font. World Bank ,(2014)

1.5.2.3. Detailed Summary Of The Result Of Recently Completed Evaluations Of Financial Education Programs

The study investigated the impact of a financial education for two hours on migrant workers in ***New Zealand & Australia***, with particular attention to their remittance-sending behavior. The seminar addressed key topics including remittances, credit management, and financial product selection, aiming to enhance participants financial decision-making and overall literacy.. (Gibson, J., McKenzie, D. & Zia, B. (2012),

Empirical evidence on financial education interventions demonstrates mixed outcomes across different contexts. In ***Australia and New Zealand***, a two-hour seminar for migrant workers improved knowledge of remittance pricing and information-seeking behavior but did not significantly alter remittance frequency, levels, or costs (Gibson, McKenzie, & Zia, 2012).

A large-scale program in ***Brazil*** involving nearly 900 schools and 26,000 students enhanced financial proficiency and savings, with complementary parental workshops further increasing student savings and producing a “trickle-up” effect on parents’ financial proficiency (Bruhn, De Souza Leão, Legovini, Marchetti, & Zia, 2013).

In ***India***, a two-day training for branchless banking customers influenced savings behavior and attitudes but did not improve measured financial literacy levels (Sarr, Sadhu, & Fiala, 2012).

In ***Nigeria***, a national savings campaign¹, celebrity endorsements and lottery incentives temporarily boosted savings behavior and financial product usage, though long-term effects dissipated once incentives ended (Holzmann, Mulaj, & Perotti, forthcoming).

Finally, in *South Africa*, FL messages embedded in the soap opera Scandal! significantly improved knowledge and behavior among low-income households, reducing gambling & reliance on informal borrowing, with messages delivered by main characters proving more memorable and impacts than those from external sources, as evidenced by increased calls to the National Debt Mediation Helpline (NDMA) (Holzmann et al., forthcoming). *Berg, G. & Zia, B. (2013)*

1.5.3. Challenges Related to Financial Literacy at the Global Scale

Despite growing recognition of its importance, financial literacy faces persistent global challenges that hinder its effectiveness and reach.

Key Challenges:

1. **Low Global Literacy Rates:** According to the S&P Global FinLit Survey, only 1 in 3 adults worldwide are financially literate. This gap is especially pronounced among women, low-income groups, and those with limited education.
2. **Digital Divide and Technological Barriers:** While digital tools offer scale-able solutions, many regions - especially in Sub-Saharan Africa and parts of Asia - lack internet access and digital literacy, limiting the reach of online financial education (Wójcik-Czerniawska, 2024).
3. **Cultural and Linguistic Diversity:** Financial concepts often fail to translate effectively across languages and cultural contexts, requiring localized and culturally sensitive content (Mishra & Malik, 2025).
4. **Fragmented Policy Implementation:** In some countries, financial literacy initiatives are sporadic or lack coordination between ministries, schools, and financial institutions, leading to inefficiencies (OECD, 2020).
5. **Misinformation and Financial Scams:** The rise of online fraud and misinformation undermines trust in financial systems, especially among digitally inexperienced users (CSIS, 2023).

1.5.4. Financial Literacy in Cameroon

According to the United Nations Sustainable Development Goal (2016), poverty alleviation requires coordinated action by both governmental and non-governmental stakeholders, with financial literacy serving as a critical factor in achieving financial sustainability.

In Cameroon, the growing availability of financial instruments such as debit cards and mobile money has heightened the need for financial education, as many citizens remain unaware of these basic financial concepts like savings, interest, insurance, and loans (Xu & Zia, 2012). This challenge is consistent with global findings that improving F.L benefits populations in both developed and developing countries (Lusardi & Mitchell, 2011; Klapper et al., 2012).

Limited institutional support for financial education in Cameroon exposes consumers to risks, such as signing contracts without understanding their implications. Given Cameroon's vision of becoming an emergent economy by the year 2035, equipping households and stakeholders with financial knowledge is essential for ensuring financial well-being and narrowing the poverty gap. This study therefore examines the role of FL in reducing poverty through an effective management of financial instruments and innovations.

1.5.4.1. Low Level Of Financial Literacy And Financial Inclusion

Research shows that many Cameroonians lack sufficient financial knowledge. This limits their participation in the formal financial sector and leading to the contribution of poor financial decision-making among individual in the economy. The Ministry of Finance (Minfi) of Cameroon reports that the access to finance in Cameroon is low and unevenly distributed, creating a significant barrier to private sector growth. Although Cameroon possesses the largest financial system within the CEMAC region, but just 12.2 % of adults hold bank accounts compared to 29 % of the adults in Sub-Saharan Africa (FINDEX, 2014). Access to finance is identified as the second most critical challenge to doing business after corruption (Africa Competitiveness Report, 2017), with

disadvantaged regions particularly the under-served (IMF, 2018; Business in Cameroon, 2018).

Formal financial engagement remains limited, with just 7.7 % of adults saving and 1.9 % borrowing through financial institutions, while more than half of the population rely on informal arrangements such as “Tontines,” (*see footnote on page 96*) which often involves high interest rates, small loan sizes, and a high risks. Financial inclusion is strongly influenced by socio-economic factors, where the more rich, well educated, and high salaried individuals probably having an accounts than less privileged (i.e the poor) , less - educated, and non - salaried proportions.

And also, Cameroon’s financial sector is made up of 14 banks, 409 micro-finance institutions, one CAMPOST, insurance & companies, and other quasi-banking entities - represented 40 % of the GDP in the year 2016, with banks controlling 2/3 of total assets (IMF, 2018; Business in Cameroon, 2018)

1.5.4.2. Impact Of Low Financial Access And Financial Inclusion.

FI has been identified as a central government policy in Cameroon. The 5 year National Strategy for Financial Inclusion (NSFI) which ended in the year 2018. This policy had as a goal to expand the access to finance for the less privilege (young, females, and small and SMEs) through targeted initiatives supporting job creation and the empowering of SMEs by financing them.

Key achievements of the NSFI included the establishment of a credit registry platform i.e CIP- FIBANE - CASEMF, putting into play new regulations for micro-finance institutions (MFIs), and notable progress in mobile money adoption. In preparation for an updated strategy, the government launched a FINSCOPE survey in late 2017, which revealed improvements in financial service access, though Cameroon continues to lag behind peer countries in bank account ownership (IMF, 2018; Business in Cameroon, 2018).

The banking sector has grown but still effective as normal. . Since 2010, the portfolio of banks expanded by almost 2/3, and another two new authorizations were given, including one for the largest MFI. Despite this growth, private sector credit stood at only 15.3 % of the GDP in the year 2016, as compared to 28.5 % in the Sub Saharan Africa regions and 33 % in Kenya. Assets are concentrated, with the three largest banks holding half of total assets, and the 5 largest controlling 70 %. In large cities like Yaoundé and Douala, they account for about 90 % of the banking credit and deposits (IMF, 2018; Business in Cameroon, 2018).

Microfinance and mobile banking are expanding, with MFIs more widely distributed in rural areas than banks. However, MFIs face challenges of a low management capabilities, weak quality of the assets, and divided oversight among the Governing body and the COBAC, the regional regulator. Mobile banking has grown rapidly with new licenses issued in 2018, offering diverse services. The insurance sector is still not developed but shows growth potential, dominated by health, vehicle, and transport insurance, which represent 75% of sales. Life insurance penetration was only 2% in 2016 (IMF, 2018; Business in Cameroon, 2018).

We also have some financial institutions trying to cope with internal crisis i.e losses and governance weaknesses. For example the CAMPOST institution which provides postal banking and IT services mainly to MFIs. And the “Crédit Foncier du Cameroun” (CFC) , which is a state owned mortgage institution funded by salary withholding and client deposits, with non-performing loans amounting to 26 % of the total assets. The state-owned pension fund CNPS, which covers about 1 million employees in the private and public sectors . (IMF, 2018; Business in Cameroon, 2018).

In addition, other actors such as quasi-banking institutions, the stock exchange, & Forex bureaux remain relatively marginal. The Douala Stock Exchange, which was established in the year 2006 ; has only three listed public companies, with capitalization below 1 % of the GDP. Though as it merged with the Libreville Exchange, it may attract private firms, by the year 2016. The MinFi of Cameroon reported 25 licensed Forex bureaux, all concentrated in the cities of Douala and Yaounde. (IMF, 2018; Business in Cameroon, 2018).

1.5.4.3. Opportunities

The micro - finance sector in Cameroon has a vital role in the expansion of financial access, and in poorer regions to be precise, however, it continues to face significant challenges. By the end of 2016, MFIs accounted for 15 % of total banking assets and served approximately 11 % of the adult population. While they provide essential services in rural and low-income areas, MFIs remain concentrated in Yaoundé, Douala, and the western regions of Cameroon, including the two Anglophone areas. Structural weaknesses persist, including poor governance, excessive owner intervention, high levels of connected party lending, weak credit risk assessment - with about one-quarter of loans in arrears - and poor capitalization.

The changes made recently in both the national and regional levels, was aimed as to strengthen the stability of the sector and its credibility. The 2017 regional regulation clarified stakeholder responsibilities. And also by assigning MFI's owners to manage internal and external controls, and the MinFi to oversee administrative functions, and COBAC to supervise operations. The regulation also introduced measures such as credit limits for individual clients, higher minimum capital requirements, stricter conditions for related-party lending, and a mandate for category-1 MFIs to form umbrella groups of at least five institutions within two years. However, detailed regulations to put in operation these requirements have yet to be enacted by COBAC.

FL in Cameroon is increasingly recognized as a vital factor for economic empowerment, FI, and sustainable development. However, Cameroon faces significant structural and cultural challenges that limit the effectiveness of financial education initiatives.

1.5.4.4. Current Landscape

The current level and structure of FL in Cameroon is however seen as the interaction of many actors in the economy. And this could demographic or socioeconomic actors. They all act as the different parameters in the functioning equation of the general economic out put of the country.

1. Low Rates of Financial Literacy : large portion of population, particularly in rural areas, lacks basic financial knowledge. This includes limited understanding of budgeting, saving, credit, and insurance, which hinders informed financial decision-making (Cameroon Marketplace, 2024).

2. Limited Integration in Education:
FL is not embedded in the national curriculum. A qualitative study by Ouandji (2018) revealed that while primary school teachers recognize the importance of financial education, they often lack the resources and training to teach it effectively. Financial concepts are taught indirectly through subjects like mathematics and home economics.

3. Digital Financial Inclusion and Mobile Money:
The rise of mobile money platforms such as MTN Mobile Money and Orange Money has expanded access to financial services. However, usage remains limited to basic transactions like remittances and airtime purchases. More advanced services like savings and insurance are underutilized due to low digital literacy and trust in formal financial systems (UNDP, 2024).

4. Gender and Regional Disparities:
There is a notable gender disparity in the access to financial services, with women disproportionately excluded. Rural areas also lag behind urban centers in both financial education and access to formal financial products (UNDP, 2024).

5. Role of Financial Literacy in Sustainable Development:
A study by Lontchi et al. (2022) found that FL positively mediates the relationship between FI and sustainable development. Social capital also plays a role, though its impact is less direct. These findings underscore the importance of financial education in achieving broader development goals.

Key Challenges

- Lack of formal financial education programs
- Limited trust in financial institutions

- Over reliance on informal financial systems (e.g., tontines)
- Insufficient outreach to marginalized populations

1.5.4.5. Opportunities for Improvement

Community-Based Education: Localized financial literacy campaigns can help bridge the gap in rural areas.

School Curriculum Reform: Integrating financial education into primary and secondary school curricula would build basic knowledge early.

Digital Literacy Training: Enhancing digital skills alongside financial education can improve the uptake of mobile financial services.

1.6. GLOBAL FINANCIAL LITERACY MEASUREMENT METHODS

Measuring financial literacy is essential for understanding individual capabilities, designing effective education programs, and informing policy. Globally, several standardized tools and surveys have been developed to assess financial knowledge, behavior, and attitudes.

1.6.1. OECD/INFE Financial Literacy Measurement Index

The OECD/INFE began to put in place its Toolkit for measuring FL and FI in the year 2009. By enacting on national survey and on the global research, expert input, and an OECD working paper (Kempson, 2009).

The 1st version which was released in 2010, was proposed in the same year and was later endorsed by the G20 leaders in the year 2013. Results from the pilot were published in Measuring FL. (Atkinson & Messy, 2012). And it was later on revised in the 2015 and put into action in the years 2015 - 2016 in almost forty countries. With also results published for 30 countries in the survey (OECD, 2016), then followed by a G20 focused report (OECD, 2017).

In the year 2018, it was further revised and it expanded its scope to include subjective financial well-being, and this version was used in the 2019/20 international survey, reported in the OECD/INFE 2020 IS of Adult FL (OECD, 2020). Beyond global surveys, the Toolkit has also supported OECD technical assistance projects in regions such as the Commonwealth of Independent States and Southeast Europe, with findings published in regional reports. (OECD, 2018; OECD, 2020).

1.6.2. World Bank Global Findex Database

FI is the cornerstone of development, with the Global Findex Database serving since 2011 as the leading source of information on how global adult engagement with payments, borrowing, savings and controlling financial shocks. The first survey results were released in 2011, followed by subsequent rounds in 2014, 2017, and 2021. The 2025 edition, based on nationally representative surveys of approximately 145,000 adults across 141 economies conducted in 2024, provides an updated indicators on the use of both formal and informal financial services, including saving, borrowing, payments, and risk management.

It also offers globally comparable data on mobile phone ownership, internet use, and digital safety, while highlighting disparities in access to financial and digital services among women and low-income populations. Each survey reflects a “ % ” snapshot of behaviors and experiences within the preceding 12 months. This enables comparisons across time to identify enduring and emerging trends. Widely cited by policymakers, researchers, and development practitioners, the Global Findex Database has become central to global FI efforts and is used to observe progress toward the United Nations Sustainable Development Goals (OECD, 2018).

1.6.3. Standard & Poor’s Global Financial Literacy Survey

The S&P Global Financial Literacy Survey assesses four fundamental concepts essential for financial decision - making: risk diversification, inflation, numeracy, and compound interest. Risk diversification is measured by asking whether it is safer to invest in a single business or across multiple businesses., with the correct response being

multiple investments. Inflation is tested by asking whether doubling both prices and income over ten years results in greater, lesser, or equal purchasing power, with the correct answer being the same.

Numeracy is evaluated through a simple interest comparison, where respondents must identify whether repaying USD 105 or USD 100 plus 3 % is lower, with the correct answer being USD 100 plus 3 %, . Compound interest is assessed through two questions: “whether a bank adds more cash in the next year than the first when applying 15 % annual interest” (correct answer: more), and “whether USD 100 earning 10 percent annually for 5 years results in more than USD 150” (correct answer: more than USD 150). Together, these questions capture basic , financial competencies necessary for informed financial behavior.

1.6.4. Other Academic Scales and Indicators

Academic researchers have developed various scales to measure financial literacy, often tailored to specific populations or research goals. These include:

- **Huston’s Financial Literacy Framework:** Distinguishes between financial knowledge and application ability (Huston, 2010).
- **Combined Literacy Scales:** MDPI (2020) proposed a six-item scale combining knowledge, behavior,¹ and attitudes with strong predictive validity.
- **OECD-INFE Core Questionnaire:** Used in academic studies to ensure international comparability.
- These tools are crucial for evaluating the impact of financial education programs and understanding behavioral outcomes.

CHAPTER 2: DIGITAL FINANCIAL LITERACY

2.1. CONCEPT AND HISTORICAL DEVELOPMENT OF DFL

Due to the COVID-19 pandemic, the global health has been seriously encountered with a threat that has remained a prior concern since 2020. This impact has been profound, this makes individuals to adapt to their daily habits and occupations. As a result of that, the governments have responded by put in place lock-downs that restricted many activities, which forced people to carry out almost most of their responsibilities remotely. Evolving technology have played an important role in enabling remote work and online education. This technological has reshaped everyday life, and among its most significant dimensions is the financial shift it has enabled.

Since the year 2018, the G20 countries have decided to enhance the DFL as part of their agenda both in education and occupation. They admit the fact that that improving DFL and FL and also sensitizing the general public about it is an advancement in the field of science. It is an important thing to enhance the level of DFL especially to mitigate all forms of cyber -criminalities when using the DFS. (Morgan, Huang, and Trinh, 2019).

However, this concept has been defined by many researchers and scholars in different points of views in time and space.

According to the OECD(2017), DFL is “ the knowledge, skills, and abilities to use digital devices, software applications, and networks to get access and manage financial accounts, conduct transactions, and make informed financial decisions online”. “The ability to understand and use digital tools and technologies to manage financial resources efficiently, make informed financial decisions, and protect against financial risks in the digital environment.”

Koskelainen et al. (2023), defines DFL as the ability to access and manage financial products and services effectively and securely using digital technologies like mobile devices, computers, and the internet.”

And as for the World Bank DFL is “ the ability to use digital technology and its utilities to get access, to manage, to understand, and to even evaluate financial products and services.” Moenjak et al. (2020).

It is quite obvious now that - from the research works reviewed- that DFL is a recent and evolving concept. These definitions highlight the multifaceted nature of DFL, stressing the need of not only technical proficiency in using digital financial tools, but also, it comprise the ability to make informed financial decisions, risk management, and protect individual financial well-being in the digital realm.

DFL has a role to play in the decision making by companies, and student entrepreneurial behavior. Digital transactions like payments with its goal to foster economic inclusion and innovations. (Hardika et al., 2022; Angeles, 2022)

2.1.1. Impact Of Digitalization On Financial Literacy

Financial literacy is a paramount skill that individuals require to prevent encountering financial difficulties (Hayati and Syofyan 2021; Cude 2021). DFL enables individuals to improved their decisions in regards to their finances (Shen et al. 2018). Nowadays, DFL is said to emerge as a more crucial element in education. This will necessitate the need to increase the knowledge of DFL and FL. (Stephen 2022). The broad availability of digital platforms and systems accessible via electronic devices, such as computers, laptops, smart-phones, and other devices, has significantly enhanced users' financial education learning experience (Tiwari et al. 2020).

Studies indicate that , individuals with high FL are more likely to accept and use digital financial services efficiently (Panos and Wilson 2020; Jain 2022). and as such , DFL enables people to gain access to a variety of f inancial products, assist financial planning, and engage with confidence in the digital economy (Meoli et al. 2022; Morgan and Trinh 2019).

2.1.1. Differences From Traditional Financial Literacy

As traditional FL is known for the principles of savings, management, budgeting and investment, DFL is known for its technological interface, has brought a wide spectrum and layers which has pointed a difference between the two as seen below.

Table 2.1. Differences Between Traditional Financial Literacy and DFL

Aspect	Traditional FL	DFL
Medium of interaction	Physical banking, paper-based tools	Mobile apps, online platforms, fintech tools
Required competencies	Financial knowledge and behavior	Financial with digital and cybersecurity awareness
Risks	Over-indebtedness, poor planning	Phishing, data breaches, digital scams
Access barriers	Physical infrastructure	Digital divide, device ownership, connectivity

2.1.2. Historical Development

In this section we are going to talk about the early forms of financial technologies which can be traced back to the mid-20th century. This was the period where these fintech reshaped the banking system and commercial activities. These technologies include the Automated Teller Machine (ATMs), Credit Cards, and Internet Banking. Onabowale, O. (2025).

ATMs were the among the first form of fintech which was aimed at providing customers with more convenient 24/7 access to cash and other banking services. This led to the elimination of constraints of the traditional banking system such as time and queuing. Onabowale, O. (2025).

As time went by, credit cards came to existence. This happened closely after the ATM. This innovation brought similar transformation effects like that of the ATM.

However, this time the card brought about cashless transactions, secure payments and other transactions and putting a steppingstone to consumer spending and global commercial activities. With coming into play companies like Visa and Mastercard, standardized credit card systems were introduced, consumers gained unprecedented purchasing power and financial flexibility, further integrating technology into daily life. Onabowale, O. (2025).

A spontaneous shift towards DFS came into effect during the 1990s, where internet Banking took over the scenario. This time customers could now access their accounts, transfer funds, and pay bills online, eliminating the need for in-person visits to bank branches. Thanks to this shift in fintech, operational cost of the banks were reduced and consumers were being empowered vis-a-vis their finances. Internet banking paved the way for a more connected, user friendly, and efficient financial ecosystem. Onabowale, O. (2025).

During the early 2000s, the spread of mobile smart phones and other advanced wireless connecting facilities led to the transition from internet banking to mobile banking. With the introduction of mobile banking apps consumers could access their account information with just a touch on their smart-phone screen. This revolutionized the way they manage their accounts, finances, real time transactions and alerts. Onabowale, O. (2025). This era could be best described as banking on the tips of fingers and away just by a click.

As this was not enough, Fintech start-ups broke the silence by introducing other alternatives like the Paypal which disrupted the known banking system payments. The Paypal enabled a fast and secure online payment system. While its “colleague” Venmo revolutionized peer-to-peer payments with its social-media-inspired interface. Onabowale, O. (2025). This now demonstrates that other payment interface could be also further put in place which paved the way to blockchain technologies.

Blockchain technologies (Cryptocurrencies) like the Bitcoin brought about emerging financial solutions. It is characterized by security and transparency. Onabowale, O. (2025). Today fintechs have proven a dynamic evolution in digital financial

services and has made itself a catalyst to innovations and enhancement of a reliable ecosystem for financial transactions across the globe. This is a promising sign that advanced analytical and personalized services for its consumers is in the future.

2.2. IMPORTANCE OF THE CONCEPT OF DFL

The importance of DFL can't be ignored at this point, after acknowledging the changes it has brought in the socioeconomic and demographic domain of a society.

DFS has changed and improved the way different economic agents carry out carry out transactions, obtain credit, make payments, acquire financial products, participate in investments, and transfer remittances (Yang et al., 2020). DFS such as virtual banking, APIs, alternative methods for assessing creditworthiness, digital lending, and various other innovations nowadays have been adopted leading to economic connectivity. (OECD, 2018).

Being DFL literate, is a solid stepping stone for an effectively utilizing Digital Financial Services, and it stands as a significant facet of education in the modern digital era (Morgan & Trinh, 2020). However this will not be effective unless the government provides the means for the DFS to accessible. So this becomes a fundamental policy for the government. DFL, in its essence, brings together two crucial aspects: digital literacy and financial literacy.

To access the digital platforms with profound knowledge and understanding, the concept of DFL is required. This means not only having the necessary skills to use digital tools effectively but also possessing a comprehensive grasp of financial matters in the context of the digital landscape (OECD, 2018).

To measure DFL there is need to take into consideration of DL and FL. FL refers to the comprehension of financial products and services, as well as the capacity to use financial knowledge and abilities for the proficient management of financial assets and the attainment of financial prosperity (Xiao et al., 2014). In simpler terms, DL signifies the proficiency in utilizing digital technologies (AFI, DFSWG and CEMCWG, 2021).

DL is the capacity to safely and appropriately articulate, acquire, oversee, merge, convey, assess, and generate information via digital technologies and networked devices in order to engage in both economic and social activities (UNESCO, 2018). The National Rural Employment Guarantee Act (NREGA) has made FI a clearly defined objective which stands as the most comprehensive Employment Guarantee Scheme on a global scale (Pratap et al., 2017). Meaning the lack of DFL concepts will lead to the void utilization of DFS. Because even if there is FL we can not use the Digital financial platforms without the need of DL. As such they are correlated to each other.

Investors with comparable demographic backgrounds tend to demonstrate similar biases in their investment behaviors (Nair & Yermal, 2017). Research has proven that women who know how to use these services has proven to make a significant choices and decision regarding investments. This could include stocks, mutual funds, and hedge funds (Satheendran et al., 2013). Women have significant potential for enhancing their interpersonal and interpersonal abilities, ultimately leading to economic and social empowerment that equips them to address the challenges in their surroundings (Bhavani and Vidyapeetham, A. V).

DFL has also helped in the economic resilience and inclusion in most South_Asia and Sub Saharan Africa region. It has also served as a bridging gap that has led to the improvement in FL and FI whereby communities and individuals in this regions have benefited. (Kass-Hanna et al.,2022).

DFL has implications for financial behavior and decision-making. Studies have indicated that digital financial literacy influences individuals' financial behavior, including their use of digital payments, adoption of financial technology, and engagement with digital banking services (Rahayu et al., 2022; Babić & Bukvić, 2022).

Researchers has demonstrated that DFL has an important role to play in personal financial health and well-being. (Nurlailly et al., 2022). this can be seen in the sense that people with DFL financial literacy can have more access to more insurance services using the DFS. As such, individuals can prepare well for their retirement.

And also the concept of DFL is very important in the sense that it has important role to play in financial decision making and the use of DFS. Even as we notice the importance of DFL in online payment and internet banking behavior, realize that there is a correlation between the use of these DFS and DFL. (Andreou & Anyfantaki, 2021).

2.3. DIMENSIONS OF DIGITAL FINANCIAL LITERACY

The dimensions boundary of DFL are not specified. It varies drastically in relation to different contexts. However, many researchers have tried to give framework view on the dimensions of DFL. These are knowledge, Skills and Competence Dimension, Attitude and Behavior Dimension, Access and Usage Dimensions and Digital Security and Fraud Awareness.

To understand well these dimensions, we need to take the case of a survey report carried out by Putri, A. M., Wiryono, S. K., Damayanti, S. M., & Rahadi, R. A. (2024) in Indonesia. Below are the core dimensions widely studied in the literature.

2.3.1. Knowledge Dimension

This first dimension of DFL is the ability to use digital financial services. Given that the fintech has instantaneously seen innovation in the previous time, its means just the availability of the internet or DFS does not make the goals of millennium era on DFL come through. There is the need of the ability to use those DFS and a sound knowledge of the internet and also having FL. Hence use of the digital financial application in a practical manner is of paramount importance (Morgan, Huang, and Trinh, 2019). The results from the interview have five sub-dimensions that can be highlighted into the

“Ability to use digital financial applications, such as hands-off experiences, level of usage applications, level of perceived ease to use, ability to make digital financial transactions, and ability to operate DF applications.”

Some common answers taken from the interview were as follows :

*“I came to the bank and asked to download the application and then create my account” ,
“Mobile banking mandatory applications in a smart-phone ”*

*“Mobile banking is the most important application, I used it at least two times a week”,
“Creating bank accounts is no need to come to the bank and go to the customer service , it only registers from the applications and does the video call.”*

“In the past time, to send the money we needed to go to a post office and send the weasel, but now we only use mobile banking everywhere, and every time we can send the money.”

From the above responses , we can see that those who have knowledge and awareness on DFS have helped the other ones how to utilise digital financial applications and gave training on how to use those applications. (Tony and Desai,2020) . We also noticed that most of the individual or clients can deposit an application themselves than waiting for someone to that for them . We also noticed that's financial applications utilization is directly proportional to the DFL. The use of DF applications influences the ability and knowledge around them. (Kotni and Botta, 2020). When they were asked about the applications they would like the most to use they replied they preferred the mobile banking application on their smart-phones. If we notice, we well see that people will prefer using digital financial applications than the use of internet based one doe to easy assessment in time and space (Chen, 2013). from the survey, the interviewees demonstrated that they use applications such as e-commerce investment applications and mobility banking.

This shows the degree by which they are optimistic in the usage of the financial applications and as such confirms the fact that utilisation of those financial applications are directly proportional to to the their knowledge and awareness.

Fintech enables people to get easy access to financial products and gain DFL knowledge and help them do their financial transactions (Hapsari 2021). This implies that's knowledge and awareness DFS make the core part to the the ability to do DF transactions..

2.3.2. Skills and Competence Dimension

This dimension focuses on the technical and operational abilities to use DFS effectively such as navigating mobile banking applications and fintech platforms, executing secure digital transactions (e.g., transfers, bill payments), using budgeting and investment tools online.

The main DFS include e- money, financial mobile applications, and branch-less banking etc., which are used to carry out operations in the financial sector. (OECD and G20, 2018), as such a good foundation knowledge is needed to accompany users of DFS. Some related responses from the interviewee are:-

“ Fintech is making the transactions easier, so we don’t need any physical transactionsn.”

“ Fintech change the transactions habit to digital and online.”

“ I usually prefer not to bring any cash and prefer to bring my smartphone to do the Qris transactions.”

“ Credit cards can make the transactions cashless,,.”

“ I use bibit and ibareksa applications as investment applications.”

Putri, A. M., Wiryono, S. K., Damayanti, S. M., & Rahadi, R. A. (2024).

If we go back to the survey above, we will find that the majority of the interviewees responded by having a Fintech application which they use daily. This application include banking application in their smart-phones that is capable of supporting the those DFS and they are proficient in using that. Furthermore, due to the easy access, real time information and convenience has led to the use of mobile banking application.(Sitorus et al. 2019). Many people use DFS to enhance their psychological health., facilitation of productive bushiness relationships, and elevation of efficacy. (Elliot, Cavazos, & Ngugi 2022)

2.3.3. Attitude and Behavior Dimension

The third dimension of DFL is the awareness of positive *financial attitudes* and behavior. Here, the DF decisions are determined by the psychological and behavioral aspects. It includes: Trust in digital financial systems and providers, Willingness to adopt new technologies, Responsible financial behavior (e.g., avoiding impulsive spending online). Example: Choosing to spending on e-commerce platforms or save via a digital savings applications

People with low level of FL show a negative financial attitudes and behaviors. (Khalisharani, Johan, & Sabri, 2022). The way People understand, analysis, and the management of their financial matters correlate to their financial attitudes, . Edwards, Allen, & Hayhoe, (2007) and vice versa , . From the response received from those interviewee mentioned earlier ., five sub-dimensions of awareness of positive financial attitudes and behavior were underlined. It consist of cash-flow management, budgeting, to have ., an emergency fund, to know their income, and lastly the awareness of, investment. Putri, A. M., Wiryono, S. K., Damayanti, S. M., & Rahadi, R. A. (2024). Here are some of their responses that will enhance the understanding of the concept.

“ I have separate. , banks account for daily life and my skincare & shopping needs.”

“Every month, I create a budget for children's school needs & for family's daily life.”

“A couple of years ago, I did n't have an emergency fund, and I think if I need money, I just took from my investment. However, I realized the importance of emergency funds after disaster struck my family. It is important so it will not disturb our cash flow and not use any assets which we can use for our future plans.”

“Incomes is from my payroll, . and I have an online shop.”

“Investing is important, but the most important thing is if we we have enough knowledge about investing first. ?”

Putri, A. M., Wiryono, S. K., Damayanti, S. M., & Rahadi, R. A. (2024).

From the results of this survey we can conclude that;- To put in place an emergency fund is of paramount importance, is very helpful as a vital prevention from financial uncertainty and risk. The presence of such a fund is indicative of an individual

financial knowledge and is also closely related to their level of FL (Babiarz & Robb, 2014). Further more, it is very important in shaping one's digital financial literacy. A strong foundation in financial education leads to responsible and effective financial behavior and a proactive attitude toward maintaining an emergency fund (Marsden, Zick, & Mayer, 2011).

An Effective cash flow management hinges on understanding which source of income can meet one's expenses. Without this primary awareness, people struggle to manage their finances. To recognizing and understanding income sources is therefore a key marker of a well financial behavior and mindset (Setiawan et al., 2022). Research by Morgan & Trinh (2019) and Xue et al. (2019) argue that the demography income and age are vital factors to determine FL. Given that all interview participants disclosed their income, it suggests that income may correlate to DFL levels.

Investment awareness came as the final sub-dimension discussed by the individual interviewees. Notably, only a small portion of those individual interviewed expressed concern about their knowledge before making investment decisions. FL is a strong predictor of investment intent and awareness (Hapsari, 2021). Investing, when approached with adequate knowledge and awareness, shows and example of positive financial behavior and contributes meaningfully to the total financial well-being (Sugiharti & Maula, 2019).

2.3.4. Digital Security and Fraud Awareness

This is all about taking risk related decisions like consents and privacy. Digital financial risk could be defined as the added vulnerability individuals face when engaging with digital financial services unlike traditional financial products (Normawati, Rahayu, and Worokinasih, 2021). To be able to evade these risks effectively, individuals must acquire a clear understanding of how to use digital financial tools like mobile apps without risking or putting n themselves to potential threats. This is what is known as digital financial risk control, which have or include various competencies. This could also mean the ability to recognize and or avoid false financial information and the abuse of digital devices, and also the awareness of specific risks such as phishing, profiling,

hacking, SIM card swapping, and personal risk tolerance. It also involves understanding safety measures, being conscious of digital financial threats, having the capability to resolve financial issues that arise in digital contexts, and managing financial risks effectively. Furthermore, it includes the awareness and the ability or skill to protect personal information and maintain confidentiality in digital financial environments. (Normawati, Rahayu, and Worokinasih, 2021).

Faulty financial information and the miss use use of digital devices makes part of the risks which is associated with digital financial services, and knowing these threats is considered a key aspect of self-defense in the digital financial arena (Lyons, Kass-Hanna, & Joseph, 2021).

When we look back to our to the above survey to the interviewees, the main risk they identified as the most important are “phishing, profiling, hacking, SIM card swapping, and understanding personal risk aversion and tolerance.” Their understanding of phishing goes along with the definition provided by Bhavsar, Kadlak, and Sharma (2018), describing it as a cyber_crime technique used to acquire personal information using means e-mails, phone calls, and other possible ways. We now realize that those clients or individuals with lower levels of DFL are more opened to to phishing or alike attacks (Morgan, Huang, & Trinh, 2019). Being in the system of being vulnerable, can also lead to unauthorized access to personal data, commonly referred to as profiling and hacking. When consumers or clients use the knowledge DFL can improve the safe use of fintech of these tools and offer protection against digital fraud, including profiling and hacking (the Organization for Economic Co-operation and Development, 2020). we come to the conclusion that, risk avoidance and risk tolerance are recognized as dimensions of DFL (Ribeiro et al., 2018). Risk avoidance aversion reflects a tendency to avoid uncertain ,risky or potentially harmful situations (Thomas, 2013), meanwhile risk tolerance indicates an individual's willingness or decision to accept and manage potential risks (Hanna et al., 2011).

One of the most importance of sub-dimension of the Digital Financial Risk Control (DFRC) is the *Level of Safety*., A critical knowledge of DFL is closely linked to greater compete nce in using DFS very well. According to OECD and G20 (2018), the

efforts to implement safety in digital finance apps or interface should be in accordance to the improvements in users' ability to navigate these services. Putting in place secure digital financial practices is essential for promoting financial well-being. The lack of awareness of digital financial risks, individuals cannot effectively manage or avoid them. Triloks (2021) argues that , the core components of digital financial literacy include awareness of how to use digital financial services, understanding the risks associated with them, and knowledge of consumer protection and redress mechanisms.

Also (McKinsey, 2017) argues that digital finance has put in place a new type of risk known as *the Digital Financial Risk*, this risk which includes the potential exposure of digital asset data . Effectiveness in the management of these risks, supported by a solid foundation in digital financial literacy, can lead to more informed and secure financial decision-making (Lajuni et al., 2018). While maintaining the confidentiality of personal identification numbers (PINs) is more important and essential, many interviewees recognize the fact that they can share, this information with some very few trusted individuals. PINs are widely used across various digital financial platforms, such as ATMs, card payment systems, and other transaction services, to give access (Korauš et al., 2019). The frequent sharing of PINs among close contacts pave the way to the growing risk of PIN leakage and infiltration. Most of those who participated reported disclosing their PINs to family members like their spouses or their parents, just because of the fact that they can access to financial services in emergency situations. This behavior aligns with the sub-dimension of digital financial risk control that emphasizes awareness and protection of personal information.

When we go back to the to the survey made above by Putri, A. M., Wiryono, S. K., Damayanti, S. M., & Rahadi, R. A. (2024). we can see the following responses.

“In my view,. we should not be as open as that - for sharing our digital financial data because there will be a risk if we share the dat,- but we need to share the data with our closed family.”

“If we have savings, we don not save only in one place, but we need to separate that because if one is getting bad, there is a chance that the other will get better.”

“I think it is quite important to keep the PIN secret, but I need to share it with my wife .”

“I am wondering if the ATM machines are having eye censored for risk mitigation.”. Putri, A. M., Wiryono, S. K., Damayanti, S. M., & Rahadi, R. A. (2024).

2.3.5. Access and Usage Dimension

This dimension shows the actual engagement with digital financial services and the ability to overcome access barriers. It includes:

- To have an ownership of DF devices and have an access to the internet
- Frequency and diversity of the use of DFS for example mobile payments, online investments and dept management.
- To be able to access customer support system and resolve issues digitally an example is regularly using mobile money for daily transactions and accessing digital financial education resources.

Gulati et al. (2025) highlight that access and usage are critical for translating digital financial literacy into financial well-being.

2.4. FACTORS AFFECTING DIGITAL FINANCIAL LITERACY

DFL has a variety of complex and interrelated factors to each other that influence how individuals can understated and interact with digital financial tools and services . Many studies have examined these effects and influences, offering insights into the wide range of elements that contribute to an individuals digital financial capabilities. Among these, financial knowledge is the determinant.

Researchers suggests that people who have a strong foundation in financial concepts can show higher levels of digital financial literacy. Hence this will make them make a good choice and can manage their digital financial platforms with confident (Andreou & Philip, 2018).

Among these factors we also have the demographic factor which including age, gender, educational attainment, and income. This is very important in the shaping of individuals levels of DFL. Evident has proven that that these variables substantially influence the way people understand and use digital financial tools, while taking in to account the need to put in place diverse demographic backgrounds when promoting DFL (Azeez & Akhtar, 2021; Naufalin & Tohir, 2022).

Additionally, among these factors that influence DFL we have the levels by which individuals use digital financial services such as mobile banking, online banking, and systems that use fintech payment systems has a notable impact on their DFL. The use of these technologies always makes users to be familiar and confidence in it, which will therefore contribute to the higher levels of digital financial competence (Melubo & Musau, 2020; Azzahra et al., 2022).

Furthermore, FI and access to formal banking institutions have also demonstrated to be an important factors that influences DFL. Researchers have found out FI that the people who are financially included are more likely to engage with digital financial services, underlining the strong link between financial inclusion and digital financial literacy (Hasan et al., 2022; Hermawan et al., 2022).

In addition, the role of educational and regulatory interventions in enhancing digital financial literacy has been widely examined. Findings suggest that well-designed educational initiatives and robust regulatory frameworks can effectively improve individuals' understanding and use of digital financial tools, reinforcing the value of strategic interventions in fostering digital financial competence (Hasan et al., 2022; Respati et al., 2023).

The influence of financial confidence and well being no digital financial literacy has been known. Studies have shown that individuals' financial confidence and well-being can also influence their engagement with DFS, highlighting the psychological and emotional dimensions that shape digital financial literacy (Respati et al., 2023).

We also have impact and influence of cultural and religious factors, such as Islamic financial literacy, has also been identified as a significant influence on individuals' use of DFS. Understanding the intersection of cultural and religious norms with digital finance is crucial for promoting inclusive and contextually relevant digital financial literacy initiatives (Suhasti et al., 2022).

2.5. DIGITAL FINANCIAL LITERACY IN THE WORLD

DFL has emerged as a global priority in the effort to promote inclusive financial systems, economic resilience, and consumer protection. As financial services increasingly shift to digital platforms, the ability to understand and use these services safely and effectively has become essential for individuals across all regions.

2.5.1. Global Trends And Importance

According to the World Economic Forum, while 76% of the global adult population now has access to a bank or mobile money account, DFL remains significantly underdeveloped, according to the World Economic Forum. This difference poses quite a challenge to the success of FI initiatives, particularly in developing regions.

The G20/OECD-INFE Policy Guidance underscores the importance of integrating DFL into national financial education frameworks, recognizing it as essential for effectively using DF tools, assessing risks, and making informed financial choices. The World Bank also notes that fintech-driven DFS have the potential to lower costs, enhance transparency, and expand access for under-served communities. However, these advantages may not be fully realized without sufficient digital financial literacy.

The World Bank highlights that digital financial services—powered by fintech—can reduce costs, increase transparency, and improve access for under-served populations. However, without adequate digital literacy, these benefits may not be fully realized.

2.5.2. Regional Insights

Adel, N. (2024) presented the following regional insight in a research. This shows how the different geographical areas and their associated factors determine how digital financial operations are carried out.

Sub-Saharan Africa: Mobile money platforms have expanded rapidly, but digital literacy remains uneven. Many users rely on basic functions like airtime top-ups and remittances, while advanced services like savings and insurance are underutilized due to low DFL. Adel, N. (2024).

Asia-Pacific: Countries like India and Indonesia have launched national digital literacy campaigns, integrating financial education into mobile platforms and school curricula. Adel, N. (2024).

Latin America and the Caribbean: Fintech adoption is growing, but digital literacy gaps persist among older adults and rural populations. Adel, N. (2024).

Middle East and North Africa: Cultural norms and gender disparities influence digital financial behavior, prompting targeted DFL initiatives for women and youth. Adel, N. (2024).

2.6. STRATEGIES FOR IMPROVING DIGITAL FINANCIAL LITERACY

Improving Digital Financial Literacy (DFL) is essential for empowering individuals to navigate increasingly complex digital financial ecosystems. Effective strategies must address diverse user needs, technological barriers, and socioeconomic contexts.

1. Education and Awareness Campaigns

National Literacy Programs: Governments can integrate DFL into school curricula and adult education programs. For example, India's Digital Saksharta Abhiyan and Indonesia's OJK Literacy Campaign target youth and rural populations. Adel, N. (2024).

Public-Private Partnerships: Collaborations between fintech companies, NGOs, and regulators—such as Binance's IT Generation program in Ukraine—offer scalable models for outreach.

2. Leveraging Technology

Mobile Apps and Gamification: Tools like Mint, Robinhood, and educational games help users learn budgeting, investing, and digital safety in engaging formats.

AI-Powered Chatbots: These can provide real-time financial advice and fraud alerts, especially useful for low-literacy users. Adel, N. (2024).

3. Inclusive and Localized Content

Multilingual Platforms: Content should be tailored to local languages and cultural norms to ensure accessibility.

Gender-Sensitive Approaches: Programs must address barriers faced by women, such as limited device access or financial autonomy. Adel, N. (2024).

4. Cybersecurity and Consumer Protection

Digital Safety Modules: DFL must include training on password hygiene, phishing awareness, and secure transactions.

Regulatory Oversight: Governments should enforce transparency and ethical standards among digital financial service providers. Adel, N. (2024).

5. Community-Based Initiatives

Peer Learning Models: Local champions and community educators can foster trust and engagement.

Microfinance Institutions: These often serve as entry points for digital financial services and can embed literacy training into their offerings. Adel, N. (2024).

6. Monitoring and Evaluation

Impact Assessment: Programs should include metrics to evaluate behavioral change, financial resilience, and digital adoption.

Adaptive Design: Feedback loops allow for continuous improvement and responsiveness to user needs. Adel, N. (2024).

CHAPTER 3: DIGITAL FINANCIAL TOOLS

3.1. DIGITAL FINANCIAL TECHNOLOGIES AND THEIR TYPES

Digital financial technologies (Digital Fintech) comprises a variety of innovations in the financial sector whereby they are transforming and orientating how economic agents and institutions access, manage, carry out transactions and interact with different financial services. These technologies help to promote and enhance efficiency, inclusion, and personalization across banking, payments, insurance, and investment platforms.

3.1.1. Mobile Banking and Internet Banking

Nowadays, internet banking and mobile banking is very common in the daily transactions and is no longer something new methods of accessing banking. With the Internet increasingly accessible as well as the development of growth will be the use of internet and mobile banking, it can be seen the extent to which the importance of the quality provided by the bank.

In the past decade, banking functions have been virtualised or digitalised on a large scale. We have observed a shift from physical money payments to electronic payments, and we have also seen the replacement of savings books, share certificates, and branch service advisors with online, digital alternatives. In the year 2009, the global volume of non-cash transactions like credit transfers, direct debit, card payment transactions was reported to be about 260 billion, having grown at an average rate of 7 % since 2001 (Capgemini and RBS 2011). Reports also say that in the Eurozone, over 60 billion cashless transactions was made in 2011 after growing over 4 % annually from 2009. Despite the crisis that hit the major European economies in the years (ECB 2012).

The increase of internet and mobile technologies in the financial system has significantly reshaped banking, making internal operations, in the wider financial industry's value chain, and how other banks engage with *customers* and *clients*. Between

2004 and 2009, the proportion of income from e-commerce grew from 9 % - 13 %, this shows the increase in the reliance on electronic sales channels (ECB 2010).

Meanwhile, mobile phone usage increase from around 20 subscribers per 100 people in 1997 to more than about 120 by 2008 driven by the proliferation of smart-phones with internet access. Another research reports that 70 financial institutions revealed that 45 % prioritized mobile channel development in 2013, and also 63% expected it to be a key focus over the next three years (Misys and Finextra 2012). This illustrates the growing influence of internet and mobile platforms on banking practices and usage. Since introducing a mobile version of its regular online banking channel, over 1.2 million people have downloaded the app (ING 2012). Over one out of three of the Dutch population now has access to the bank through their smart-phone and/or tablet. The average interaction is about of 3.5 times a week compared to once a week via the 'classic' internet banking channel.

3.1.1.1. Internet Banking

Internet banking is a young banking innovation with an unclear and uncertain future. This is because there are issues that include the nature of the impact of internet banking in the context of dynamism occurring in the industry such as escalating competition, changing consumer behaviour and needs, globalization, deregulation, disinter-mediation and the emergence of new financial service models. Furthermore, despite the range of inhibiting and motivating factors identified regarding the diffusion of innovation (Bradley and Stewart, 2002).

Karen Furst, et al (1998) said internet banking is the use of the Internet as a remote delivery channel for banking services, including traditional services, such as opening a deposit account or transferring funds. Among different accounts, as well as new banking services, such as electronic bill presentment and payment, the which allow customers to receive and pay bills over the bank's website.

From this sense, we can now define internet banking IB simply that internet banking is a form of internet media used by the bank to promote and conduct transactions online at the same time, both of the products that are conventional and new.

3.1.1.1.1 History Of Internet Banking

We have to briefly look back at the history of internet banking to understand its evolution and to have an idea on how its future is unpredictable by Rich, W. (2024, March 15) and England, J. (2022, June 8).

Internet banking began by the introduction of ATMs in the years 1960s, allowing basic transactions without visiting any branch. In the years 1980s, banks and financial institutions experimented with remote computer access to account information, though these services had quite some limitations. The 1990s was characterized by a major shift with the rise of the World Wide Web (www.), paving ways for banks to offer online services like balance checks and transaction history. By the mid-1990s, full-service online banking emerged, including bill payments and fund transfers. During the late 1990s the system experienced a rapid expansion because more banks integrated or let me say entered the digital space. And in the early 2000s, we experienced enhanced security measures which were introduced to protect users. And towards the end mobile banking gradually gained popularity in the middle of the years 2000s, making transactions via handset or smart-phones. The 2010s saw fintech companies disrupt the industry with innovative digital solutions. And at last in the 2020s, internet banking continues to evolve till date, focusing on user experience, and sophisticated mobile features, and advanced technologies like AI and blockchain.

3.1.1.1.2. Advantages Of Internet Banking

Convenience: Customers who use internet banking can access the accounts they have and complete transactions around-the-clock, forgoing the requirement to visit actual bank locations during set business hours. It gives one the freedom to manage their funds from the convenience of their home, workplace, or any location using an internet connection.

Accessibility: Geographical limitations are removed by internet banking, allowing users to access their bank accounts from any part of the world. People who reside in rural areas or do not have access to actual bank branches can particularly benefit from it.

Time-Saving: Online banking saves time by removing the need to drive to a bank, stand in queue and complete paperwork. Simple tasks like paying bills, checking accounts, and transferring money can be finished in just a couple of minutes.

Cost efficiency: Internet banking allows financial organizations to operate more cheaply, which can result in cheaper fees & better interest rates to customers. Clients can save money by avoiding the costs of parking and transportation when they visit a physical branch. Transaction History and records. Customers can view transaction history through online banking, allowing them to keep track of their account activities in real-time. It is simpler to track and handle personal money with detailed digital records.

Electronic fund Transfers: Funds can be easily transferred by customers among their accounts, to different people, or to other accounts at other banks. This makes it possible to send money quickly and securely for purposes like paying rent or transferring cash to family members. Bill payments. The ability to schedule and automate bill payments using internet banking lowers the likelihood of missing payments & late fees. Utility, loan, and subscription recurring payments can all be set up by customers.

Paperless Statement: Receiving statements electronically through online banking is a common option, eliminating the requirement for paper statements while encouraging environmental sustainability.

Enhanced Security: In order to protect client information and transactions, banks make significant security investments. Encryption, multiple-factor authentication, and ongoing monitoring are frequently used in these safeguards. Alerts for questionable behaviour on a customer's account can be set up.

Customer Support : Online banking solutions often provide customer service via phone, chat, or email, offering assistance and speedy problem-solving. Online sources for education and frequently asked questions are common.

3.1.1.2. Mobile Banking

The dictionary of computer and information technology MOBILE BANKING (M-Banking) defines mobile banking as banking facilities through mobile communication such as smartphone and handphone. Dengan provision of facilities similar to ATM but to take the money in cash. ([Http://www.total.or.id/info.php?kk = Mobile% 20Banking](http://www.total.or.id/info.php?kk=Mobile%20Banking)). With the M-Banking technologies, banks tried to facilitate access and usage to its consumers in conducting their transaction with M-Banking service, in this effect, customers of banks that already have the service certainly did not need to go to the ATM or Bank office to perform any financial operation. As a result almost all banks in has provided M-Banking either SIM tolkit (Menu Service Data) or plain text (sms manual) or known as SMS banking.

3.1.1.2.1. The Evolution Of Mobile Banking

For us to get a good understanding about mobile banking, we have to know where how it began and where it is today and its future could be predicted as technology is spontaneously dynamic. So we have to summarize the researches done by many researchers in this domain. We would look at the work of Day, D. (2024) and Shoutem. (2021) below.

The stated that Mobile banking began in the late 1990s, with U.S. banks and even the postal service whereby they began adopting SMS technology to keep in touch with clients or customers and also track mail for delivery. That same year, the Wireless Application Protocol (WAP) system was introduced, which served as a means to reduce IT costs so as to encourage innovation in mobile services. Internet banking had already allowed customers to access their accounts anytime, but it also required a computer and internet connection. Mobile banking emerged as a more accessible alternative, needing only a mobile phone and offering greater flexibility remotely. However, its some

preference over internet banking such as fewer spatial restrictions, minimal infrastructure or tools requirements, and rapid growth in mobile phone usage in the economy.

This mobile banking technology brought into effect in five distinct stages, where the end of each stage marks the beginning of a new stage .

The first stage was the basic SMS-based services, for example bill payments and account alerts. The second stage was improved by adding deposit account features and some other services. Furthermore, in the third stage, mobile networks and other media such as the internet and telephone were then used for banking, owing to the rise of smart-phones. The fourth stage was characteristic by the development of mobile operating systems like Android and JP Phone, enabling more advanced technology like mobile internet access and integration with bank systems. The fifth and current stage we are today we see advanced technologies like radio frequency identification (RFID) chips for mobile payments transactions and connections to Visa and MasterCard networks. These new technology and have expanded mobile banking to include wearable devices like smart-watches, TVs, iPads, and even connected sunglasses, reflecting the rapid and spontaneous quality and quantity growth of mobile financial services giving the expression of future dynamism in the field of mobile banking technology.

3.1.1.2.3. Benefits Of Mobile Banking

From the above research,we could develop the benefits of the mobile banking system which we could summaries in the paragraphs below.

1. Always on- mobile phone can be always or is always portable due to inherent design, allow users to interact in activities such as travel or meeting people, while transactions via mobile devices are equipped with Internet.

2. **Location-centric-** Not only is mobile phone in all places, Global Positioning System (GPS) may be created to recognize phone and tries to personalize based on existing services. Identifying the location of Internet users, provides a special advantage

for mobile commerce over wired e-commerce. Using this technology, the mobile commerce providers will enable to receive and send information to a particular place.

3. **Convenience**- Other people are not limited by time or space, access to electronic activities. For example, people who are stuck in traffic or waiting in the queue will be able to buy their favorite Internet-based activities or managing their daily transactions through mobile commerce applications. Consumers can know a special comfort that can improve their quality of life. By making services more comfortable, the customer will be more loyal. As a result, Communication facilities with mobile commerce applications to provide a comfortable.

4. **Customization** - Mobile phone is much higher influence than personal computers. Therefore, mobile commerce producers to design more creative and more customized lifestyle tool. For example, using demographic data collected by wireless service providers, and information on the current location of the mobile users can do more targeted advertising. Advertising messages can be customized based on the information provided through consultation with the user's initial or previous users' shopping habits.

5. **Identify ability** - Mobile phone provides to support the secure mobile phone transactions where personal computers are almost unknown (no name). One person always uses mobile devices and it is ideal for Personal -based target marketing, through the technology of Global Positioning System (GPS), service providers can recognize a user carefully. Personalize opportunity to deliver messages to different parts of space and time through sound and look. (Skinner,2011).

Giving the fact that mobile banking and internet banking having these same objectives, we can however distinguish their special and different tasks in table 3.1. below.

Table 3.1. Differences Between Mobile Banking And Internet Banking

Feature	Mobile Banking	Internet Banking
Device	Smart-phones and tablets	Desktops and laptops
Access Method	Mobile app, SMS and USSD	Bank's website via browser
Functionality	Basic services (balance check, transfers, bill payments)	Advanced services (loan applications, investment tools)
User Interface	Touchscreen-optimized apps	Browser-based dashboards
Security	PIN, biometric, two-factor authentication	Passwords, OTPs, security tokens
Convenience	On-the-go access	Home or office access

3.1.2. Digital And Biometric Payment Systems

3.1.2.1. Biometric Payment Systems

Biometric is the field that deals with measuring the characteristics of living organisms, including humans of course, but also animals and plants. At the basis of the application of biometric in the field of authentication and identification lies a number of characteristics of living organisms, which allow the unambiguous distinction of an individual against the population.

Biometric payments are an authentication system for transactions that relies on the biometric information of each customer. Instead of using a PIN code to authorize the payment, it is based on the customer's own biometric identification features, such as fingerprint, voice, facial recognition, etc. (Clodfelter, 2010; Sulaiman and Almunawar, 2022). This type of payment systems usually has two variants. The first is a hybrid system that combines traditional methods, like chip cards, and biometric data. The second variant

refers to systems that only require biometric information to efficiently complete a transaction. (Zarco, Giráldez-Cru, Cordon, & Liébana-Cabanillas, 2024).

There exist various types of biometric technologies which are used as of biometric recognition types that are available for digital transactions . A summary of some of the recognized and commonly used biometric technologies is discussed in this paragraph.

These technologies include *fingerprint recognition*, *facial recognition*, *iris recognition*, and *voice recognition* as seen on figure 3.1 . These modes can be used individually or combined. This is known as multi-modal biometrics and it is for enhanced protection. We have devices like ATMs which will be discussed in the next chapter can verify users using scanning fingerprint and iris scans technology.

In mobile payments systems and online payments systems, biometrics has come in place of traditional tokens and cards, where smart-phones enabling fingerprint and facial recognition, while Android application system often support iris scans. Voice recognition is also used, making voice payment transactions effective. Apple Siri, Microsoft Cortana, Google Now, and others have voice authentication systems to interact with mobile phones to execute some processes such as depositing or paying with a voice command like "Siri, pay with Zelle.".(Kuraku, Gollangi, & Sunkara, 2020).

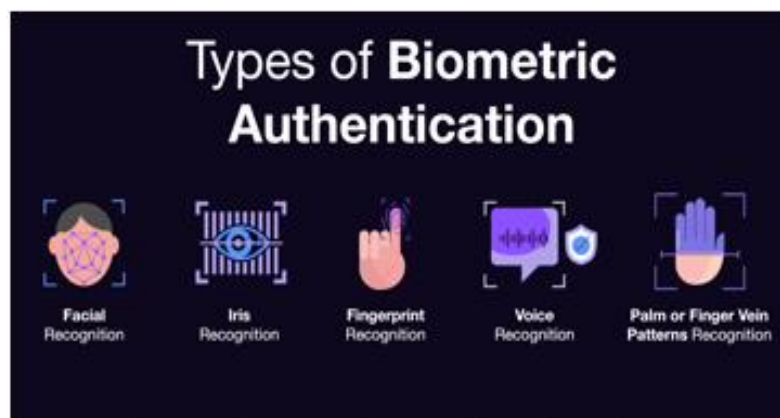


Figure 3.1 : Biometric Payment Systems

Source: Kuraku, Gollangi, & Sunkara, (2020).

3.1.2.1.1. Fingerprint Recognition

Fingerprint recognition technology is used widely in biometric method for digital transactions security. It checks users identity, but does not carry out transaction itself, offering a an efficient alternative to the technology using the PIN systems . AI enforces this process by the changing the fingerprint input patterns to a compact biometric data. This technology helps to facilitate payment and makes it very fast, especially in retail settings, by eliminating the need for pass word codes or paperwork. Fingerprint authentication works by comparing the image captured to stored information , using features like *ridge endings and bifurcations* known as *minutiae*. There exist two main types of fingerprint scanners: optical-scanner, which stores and matches images, and semiconductor-scanner, which uses pre-processed models for faster and more space-efficient transactions.(Kuraku, Gollangi, & Sunkara, 2020).

3.1.2.1.2. Facial Recognition

Facial recognition technology is primarily used in digital payments to increase the speed of the authentication process, though it also have some challenges in delivering a customer experience compared to methods like fingerprint or card payments. It requires user consent and active participation, like looking the camera, which can also cause disruption and friction. Despite this, facial recognition helps in security and has become a key biometric tool in industries including finance. For example, Alibaba's Ant Financial launched the "Smile to Pay" service in 2017 in all KFC outlets in China, and after by Alipay's offline facial payment system in 2019. The technology works by capturing and analyzing the unique facial features for the identity verification system. And also it is widely used in border control stations and secure access systems like schools and job sites.(Kuraku, Gollangi, & Sunkara, 2020).

3.1.2.1.3. Iris Recognition

Iris recognition is a form of highly accurate biometric technology. This technology methods is usually used in digital payments, offering fast and reliable and easy identity verification through real-time matching technology. This type of technology

uses *Hamming* distance to compare Iris feature vectors which is been captured by wearable by an individual or hand-held devices like phones, this enhances very quick authorization decisions in the process. This is done by the system balancing data volume, its template size, and also its quality so as to optimize its performance. A micro-engine compares now the biometric templates stored with the live data. After doing that, if the match score is greater than the set threshold, the transaction is approved. The process involves capturing the iris image with near infrared light device. Then now, segmenting the iris region, normalizing the size variations, and extracting feature vectors using a well and precise trained filters. These vectors are then all compared against stored data to verify identity if the information is in match with the correct one. Iris recognition is usually valued for its low false rejection characteristics and for its acceptance rates, and also its ability to operate efficiently in a standalone system or connected one. This makes it an ideal for a secure, real-time payment authentication. (Kuraku, Gollangi, & Sunkara, 2020).

3.1.2.1.4. Voice Recognition

As the previous technologies as well, voice recognition technology is also gaining world attention. This is as another secure method for authenticate digital financial transactions and protecting user privacy. Many researchers are building up this type of a technology by integrating or putting in big data and artificial intelligence. This is the reason that improves the accuracy of voice and facial recognition systems in a device. As such, these improvements have led to higher true positive rates and also lower false positives. In addition, it is also boosting the reliability and safety of payment verification system. Despite its potentiality characteristics, voice recognition involves complicated processes like user registration, speech and feature extraction, and recognition. This leads to present technical challenges. However, despite the inconveniences, voice recognition is used increasingly in digital payment systems, especially through virtual assistants systems like Siri and Google Assistant. This makes transactions more convenient and secure. (Kuraku, Gollangi, & Sunkara, 2020). However the advantages of biometric system can be seen in table 3.2 below.

Table 3.2. Advantages Of Biometrics

Advantages	Description
Security	Biometrics are unique and hard to replicate, reducing fraud risk
Conveniency	No need to carry cards or remember credentials
Speed	Faster transaction processing and verification
Contactless	Ideal for hygienic, touch-free payments
Personalization	Enables tailored customer experiences
Inclusivity	Accessible to users with disabilities or low literacy levels

3.1.2.2. Digital Payment Systems

As for digital payment systems, it is characterized by fast, secure, and cost-effective transactions. This contributes to the increased business efficiency and profitability (Global Partnership for Financial Inclusion, 2015; Klapper, 2017).

These systems involve the transferring of value between accounts using digital devices or communication patterns. These devices like SWIFT for example are considered as financial services accessed through digital platforms, including mobile devices (Agur et al., 2020).

Given the fact that, e-commerce is expanding, traditional cash payment methods are continuously been replaced by digital payments, which has as a function to inter organize the systems connecting corporate and individual users for financial transactions (METU-OCW, EPS; Hazar & Babuşcu, 2023).

In addition, other researchers describes the digital payment systems as the online exchange of money between buyers and sellers using digital financial instruments like

electronic checks or digital cash, which is then supported by banks or legal intermediaries for settlements or financial transactions (Hazar & Babuşcu, 2023). These digital payment systems include:

- i. Transactions made via payment cards for example credit cards, debit cards or prepaid cards
- ii. Transactions made via other devices for example mobile smart phones or smart devices that which enables digital payment.
- iii. Transactions made using devices that leverage application programming interfaces (APIs) and other open banking models. (Hazar & Babuşcu, 2023).

After all the above notions of digital payment systems, however see below their benefits to individuals as well as to the financial institutes.

- a. It provides cost savings thanks to higher efficiency and speed system.
- b. It gives transparency and security as such reducing the corruption and theft risk due to increasing trace-ability and accountability.
- c. It also contributes to the prevalence of the financial base by increasing access to a range of financial services.
- d. The system contributes to promoting consumption, reducing corruption, increasing productivity and creating welfare by improving income collection.
- e. Also , the rapid growing adoption of electronic payments helps assist the informal economy by ensuring that all forms transactions are carried out and properly recorded. Digital payment technologies should also give more cheap and secure access to financial services, particularly benefiting people with low income and those living in remote or under-served areas. Rathnayake, N. D. N. B., & Kasturiratne, D. (2024).
- f. Digital payment systems also help SMEs to sell on the global market and thus expand their customer base (ICC Brief 4).
- g. It creates opportunities for local FinTechs to operate in the world

Despite these important advantages of digital payment systems, there are also some difficulties. The identified challenges are related to infrastructure, regulatory, legal and socio-cultural issues (Khan et al., 2017).

h. Infrastructure: In order for digital payments to be carried out effectively and efficiently, it must have a reliable infrastructure that the majority of the public can benefit from. For example, in some developing countries, large parts of the country lack banks and do not have access to basic infrastructure such as electricity and telecommunications that drive digital payments. Dabo, M. (2020)

i. Regulatory and legal issues. The establishment of necessary legal regulations and international standards is essential for the effectiveness of the digital payment system. The nature of digital payments (for example, which laws will apply in the disputed cases and the legality of digital signatures and electronic contracts) brings with it legal issues. Nima Ballaji (2024)

j. Socio-cultural challenges: Social and cultural differences and the use of various forms of payment make it difficult to establish a digital payment system on a global level.

3.1.3. Cryptocurrencies And Blockchain Technology

The Blockchain technology has transformed the digital transactions of individuals and financial institutions. This is done by putting in place secure, fast, peer-to-peer cryptocurrency exchanges that does not have any form of intermediaries. On the hand, while cryptocurrencies like the Bitcoins and Ethereum offer more advantages over traditional systems technology, their volatility characteristics poses challenges. To avoid this, deep learning models are being put in place to forecast market trending and enhance stability in the financial system.

3.1.3.1. Cryptocurrency Understandings

Cryptocurrencies are the most secured digital currencies that use cryptographic techniques and system such as *public private* keys and *hashing* . This is to enable

peer-to-peer online payments system without any intermediaries. Given that they can be mined or bought on exchanges from other users, they are also rarely used for retail purchases. As such their rising value has enable them to become known for trading and also to a quite limited extent, for cross-border transfer transactions (CryptoCloud, 2025). The Blockchain technologies that are embedded in cryptocurrencies they are decentralized, tamper-resistant ledger where each transaction is well verified by network nodes. Beyond finance domain, blockchain tcehnology has a role to play in applications in areas like supply chain management, online voting, and crowd_funding. Financial institutions such as JPMorgan are exploring its use to reduce transaction costs.

3.1.3.3.1. Advantages Of Cryptocurrency

Here we will look at the importance or the advantages of Cryptocurrencies. They have six major advantages.

As it was earlier mentioned, while carrying out transaction payments, no intermediary or third part needed to complete the transaction process. This is due to the fact they can carry out transactions themselves, hence reducing cost of transactions (inter-bank and internationally). This has been the case with El Salvador where it adopted Bit-coin as a legal tender making it the first country to recognize and adopt it. This action led to a remittance of 23% of the GDP of the country and only about 30 % of its citizens own a bank account. Tambe, N., & Jain, A. (2024, October 29)

With its characteristics of being accessible and having freedom of finance, it can be access from anywhere and at any time 24/7 and it is categorically decentralized whereby users are prone to seizure, freezed by the government and any other change in the financial policy nor being controlled by the bank.

Moreover, in terms of security, they are highly resistant to fraud, tempering and counterfeit because a transaction made and validated can not be reversed or changed thanks to its cryptography nature . And in terms of transparency, transaction data are available to the parties which recorded on a public ledger.

They are also free from inflation. For example bitcoins have a supply limit which is fixed, whereby supporters argue can enhance it keeping its value and acts as a hedge against the inflation. They also have a good investment potential as a result of their volatility and spontaneous nature.

3.1.3.3.3. Disadvantages Of Cryptocurrency

The main one is lack of supervision in the transaction system. Because these technologies are quite broad and volatile and that it requires an amount of technical knowledge, which may as well increase the difficulty for government body and market system to supervise. The rest of the disadvantages lies in its asymmetrical functions. Where the benefit of one party is at the detriment of the other be it the government or individuals.

3.1.3.3.4. Types Of Cryptocurrencies

The first is the **Bitcoin**, which is the most popularly and valuable cryptocurrency used for transactions and settlements. It was been invented an unknown person named as Satoshi Nakamoto. Then later on introduced to the rest of the world through a “white paper” in the year 2008. And later on came thousands of crypto-currencies active in the global market nowadays.

Each one of the crypto-currency is said to have a diverse functionality and specifications e.g, Ethereum's ether is used to market itself as gas for underlying contract platform. Ripple's XRP is usually used by Banks to easily make transfers between different geographical regions. Ripple. (2024, May 31). It was been made public in 2009, and it is the most used, widely traded and covered cryptocurrency. Report suggests that in May 2022, more than 19 million bitcoins is circulating with a total market cap of around \$576 billion. And only 21 million bitcoins will ever exist. StatMuse. (2022, May 31)

After the enormous success of the bitcoin in settlements and trade, many other new cryptocurrencies started to show up like one of them known as "altcoins," have also

been in to use. Other built up currencies that exists now such as *Litecoin*, *Solana*, *Ethereum*, *Cardano*, and *EOS*. CoinMarketCap. (2021, November 21).

The second id the ***Ethereum***. It was launched in the year of 2015 by *Vitalik Buterin*. It is a programmable blockchain platform which operates a peer-to-peer transactions and decentralization applications (DApps). The Ethereum enables the smart contracts, it also decentralize finance (DeFi), and non-fungible tokens (NFTs). This makes it useful in some industries like game industry, advertisement industry, meta-verse, and also the film industry. It has a key feature which include programmable, faster block times, and no fix supply. This allows it to be a flexible currency issuance as it tries to avoid inflation. Youvan, D. C. (2024, August 26).

The third is the ***Ripple***. It serves as a mediator between transacting parties where it uses the XRP (which is also a form of crypto-currency launched the year 2021) to enable transfers from the central database (controlled by the government or other financial institutions) to more opened infrastructure. Ripple. (2024, May 31).

The fourth is the ***Litecoin*** developed in the year 2011 using the the bitcoin source code known as the first alt-coins being developed and second most popular for quite a long time. While still in the market presently with market cap of more than USD 6 billion. As compered to bitcoin, they are four time faster and a finite supply four time larger than the bitcion. TokenInsight, (2025).

3.1.3.3.5. Cryptocurrencies Legal

Cryptocurrencies are different from other fiat currencies. This is seen in the fact that they are not backed by the governments or other central banks. This makes their legal status very complicated in the global jurisdictions.

The Financial Action Task Force (FATF) looked into this issue in June 2019 by extending its Travel Rule to crypto transfers, requiring anti-money laundering compliance. Financial Action Task Force, 2019)

As of December 2021, El Salvador was the only country to accept Bitcoin as legal tender. Regulatory approaches vary: Japan recognizes Bitcoin as legal property under its Payment Services Act; China has banned crypto exchanges and mining; India is developing a regulatory framework. In the EU, cryptocurrencies are legal, and the MiCA regulation governs crypto-related financial services. In the U.S., crypto derivatives like Bitcoin futures are traded on the Chicago Mercantile Exchange, and the SEC has stated that Bitcoin and Ethereum are not securities.

3.1.3.2. Blockchain Understanding

This technology is also derived from the bitcoin technology built using a P2P database. It can be referred to as a series of blocks arranged in chronological order which also uses a cryptography technology to make sure that any elements of the block-chain are not altered or changed. Birnbaum, D. (2025, October 9)

3.1.3.1.1. Development Of Blockchain

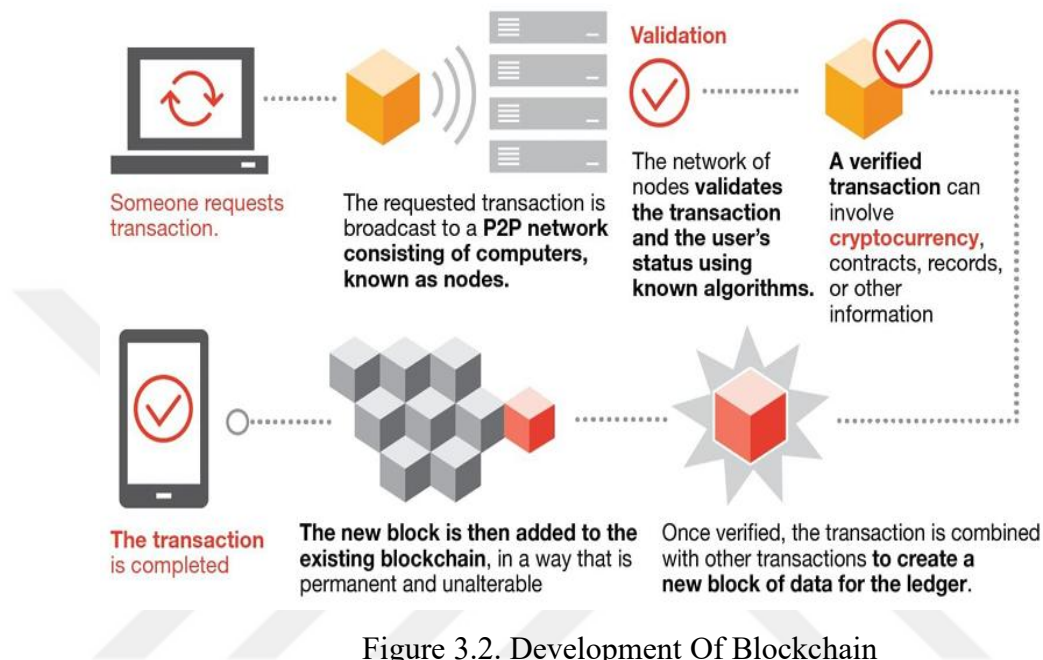
Blockchains can be distinguished by their stages of development and functions. Which are the three main phases ; *Blockchain 1.0*, *Blockchain 2.0* and *Blockchain 3.0*.

The first phase and type is the *Blockchain 1.0* which has a main function as a digital currency system. It is mainly represented by the Bitcoin technology .

The second is the Blockchain 2.0. it is mostly used by financial sectors and mostly related to smart contract with the Hallmark of its generation. With this smart card contract, the other forms of assets (not just money) are converted and related together that expand the applications of blockchain.

And then now the third generation which is the Blockchain 3.0 characterized to be programmable. This feature allows it to be used in domain out of just financial sectors by also used by other sectors like the Government, environmentalist, culture, and health care. This is done by creating a secure, decentralized and transparent system using blockchain

technologies and then integrated with other internet technologies. GeeksforGeeks. (2025, July 23). Below on figure 3.2 the creation and verification steps are demonstrated.



Source: Chong Cheong Sin, J. (2023).

The way this process works is that, a blockchain ledger having two main records: the *individual transactions and blocks records*. Then, the initial block, which is referred to as the genesis block, has a header and a data of transactions to be recorded in a given time. The block contains a time stamp. The time stamp are used to generate a particular alpha numeric identifiers called the *hash*.

The next block produced in the chain gives reference to the hash of the previous block to compute its own hash. This will generate a secured and chronological link between those blocks. , a verification process known as validation or consensus must be undergone before a new block can be added. At this phase, most of those nodes in the network must accept that the new block hash has been well calculated. This process ensures that the copies of this ledger remains synchronized and consistent. Chong Cheong Sin, J. (2023).

As the block is added to the blockchains, it becomes immutable or protected or encrypted. So now it can be referenced by future blocks but it cannot be changed. An attempts to alter a block, the hashes of the blocks(both the first and the second) would change, failing the integrity of all the ledger. Chong Cheong Sin, J. (2023).

Given that the consensus fails, the network will detects an error, to add new blocks will be impossible until this problem is resolved. The problematic block is deleted, and the consensus process is repeated over and over again to maintain the ledger's reliability. Chong Cheong Sin, J. (2023).

3.1.3.1.2. Blockchain Applications

Researchers have stipulated the ability of blockchain if it could enhance security and utility across various domains in the system technology. By addressing both the implementation shortcomings and security concerns as a whole. Many researchers argue for the integration blockchain within Information Centric Networking (ICN), while emphasizing for the authentication on inter trust dependencies to facilitate legit data exchanges.

In this line, human intervention is required so a to input data for processing and to filter the data. After that to validate the transaction a trust factor analysis is needed. It is demosntrated on figure 3.3 below. Ghazi, A., Alisawi, M., Wahab, Y. M., Al-Dawoodi, A., Abdullah, S. S., Hammood, L., & Nawaf, A. Y. (2022).

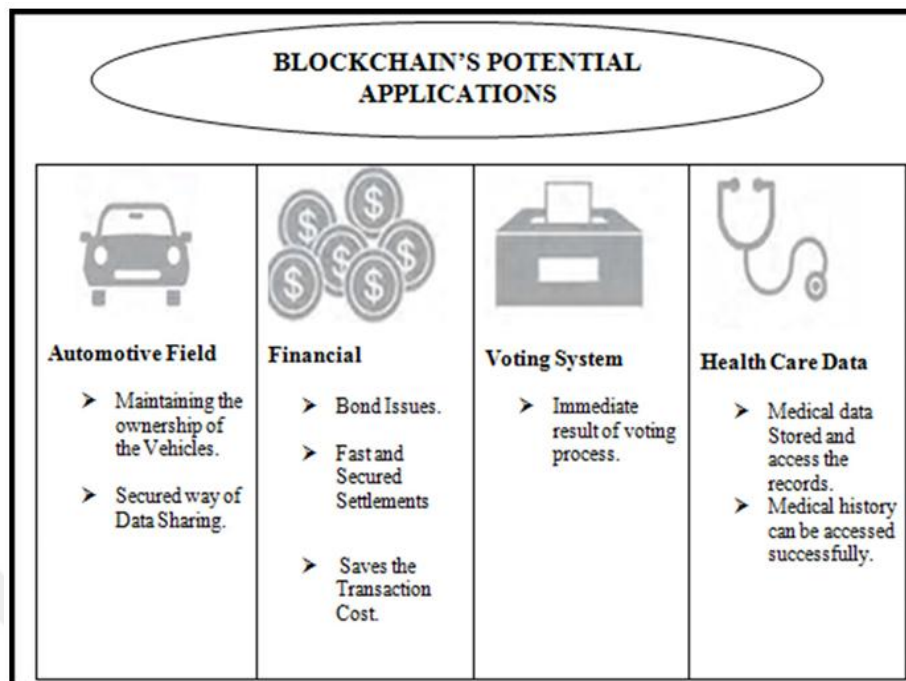


Figure 3.3. Blockchain Applications

Source: Ghazi, A., Alisawi, M., Wahab, Y. M., Al-Dawoodi, A., Abdullah, S. S., Hammood, L., & Nawaf, A. Y. (2022).

The blockchain in file sharing is mostly known to be used in observing the frequency of file sharing. Whereas in the medical domain, it plays a more intensive role. This is seen in the fact that all medical data and records can be easily retrieved, securely served, and also analyzed using this blockchain technology. Here the data integrity are ensured, results are validated, and reliable information for medical decision making are all made possible by the interconnection of each block to the next block. Y. M., Al-Dawoodi, A., Abdullah, S. S., Hammood, L., & Nawaf, A. Y. (2022).

The Electronic Medical Records (EMR) are very sensitive files shared in the decentralized system of the hospital as such, the blockchain technology enhances the security of this system. This is done by validating, encrypting and protecting these records. While also ensuring the privacy temper proof and accessed securely under controlled conditions. Y. M., Al-Dawoodi, A., Abdullah, S. S., Hammood, L., & Nawaf, A. Y. (2022).

3.1.4. Robo-Advisors And AI-Powered Financial Services

These are intelligent digital technologies that use more developed algorithms and artificial intelligence (AI) technologies to make an automatic investment management systems and financial planning services system. They are uniquely designed to control and monitor financial decision making. Also, these systems can produce personalized portfolios strategies designed to meet up an individual goals, risk, and financial profile (Eswaran, Murali, & Eswaran, 2024).

These robo-advisors can make professional grade of financial services more accessible and affordable which leads to reducing human intervention. This will democratizing wealth management for a wider audience (Eswaran et al., 2024). They use AI and machine learning (ML) language technologies to make all analysis of the market trending, to re-balance their portfolios, execute trade. It can also run tax efficient strategies live features that corresponds with the tech-savvy and cost-conscious investors. Also, the digital first characteristics corresponds with the decision to adopt the fintech. This will help catching up with high demand of seamless solutions and technology driven financial solutions. (Eswaran et al., 2024).

3.1.4.1. The Evolution Of Robo-Advisors

Early Foundations (2008–2010): The 2008 global financial crisis led to the initiations of the technology. The period was known by a global lack of trust in the traditional financial institutions and also a demand for transparency and cost effective investment solutions (White, 2023). This situation led to development of a platforms by Jon Stein in 2008 called the Betterment, and Wealthfront, co-founded by Dan Carroll and Andy Rachleff during that same period. (Scholz & Tertilt, 2021). At this time Harry Markowitz in 1952 developed the Modern Portfolio Theory (MPT) which the robo - advisor used, a framework which emphasizes on optimizing portfolios by balancing risk and return (Markowitz, 1952).

Growth and Market Expansion (2011–2015): Between the year 2011 and 2015, major firms like Vanguard and Charles Schwab intergrated the race. where Vanguard

in 2015 launched a Personal Advisor Services model where automated portfolio management with human advisors were combined. Hence, robo-advisory technologies began to embed machine learning techniques like the linear regression and decision trees. This has as an objective to refine risk assessment and personalize recommendations. Technologies like Python, MATLAB, Java, and .NET supported scale-able, data driven systems. Then now here comes Schwab's Intelligent Portfolios in 2015, paving the way to a free automatic re-balancing and tax loss harvesting. These innovations could now meet up with the global demands to the use of these platforms.

The AI Revolution (2016–2018): Between the year 2016 and the year 2018, robo-advisors started operating the artificial intelligence (AI) into these platforms, which led to the transformation of the digital wealth management. There arise platforms like Wealthsimple and SigFig implementing the AI to facilitate using and investment transactions. Chatbot advisors and conversational interfaces came to effect as a result of rise of Natural Language Processing (NLP), making financial advice more accessible.

In subsequent years, advanced techniques like ensemble models, neural networks, and reinforcement learning were implemented by robo-advisors to improve the forecasting management and the dynamic portfolio management. This was made possible by the used technologies like TensorFlow and scikit-learn.

Deep Learning and Personalization (2019–2021): Robo-advisors has seen a significant dynamism by which has been triggered by the improvement in deep learning and real-time analytic technology since the year 2019. (Tiberius et al., 2022). Moody's and NetOwl began operating NLP-based sentiment analysis. This is to translate and monitor market activities from news and social media platforms (Siyongwana, 2022), and MRP data technology is used to contextualize investment decisions (Hermansson, 2018). The LSTM neural networks has turn to be a good time series predictions. This helps variable investment strategies (Sahoo et al., 2019). Programming languages like Julia and front end frameworks like React were also introduced. They help to make data processing and user experience very friendly respectively (Gao et al., 2020). Also period also saw the introduction of "clickless" interactions using NL commands and streamlining user engagement (Punzalan et al., 2024).

Explainable AI and Hybrid Models (2022 - 2024): Now comes the years 2022 to 2024, where robo-advisors have seen the the virtue of transparency and user trust. Thanks to the Explainable AI (XAI) , which gave the permissions to platforms to elaborate investment decisions clearly, taking into account concerns about the opaque “black-box” algorithms. DARPA was the first to introduce it 2017, hence XAI became a key tool in bridging the trust gap between AI systems and consumers.

At this juncture in time, the combination of AI advisors with human advisors became very popularity. Vanguard upgraded Personal Advisor Services were the actors, adding GPT-based chatbots and support learning to personalize portfolio management. Rust and Go were highly used to support these developments, secure and scale-able programming languages

While at this time, world financial regulators bodies started to bring up ethical standards for AI in finance, which was focusing on fairness, bias mitigation, and responsible algorithmic behavior. This laws helped shift underscored the industries commitment to become more ethical AI deployed and reinforced the need for human oversight in financial planning.

Future Directions (2025 and beyond): The next and future evolution of robo-advisors will be characterized by a sophisticated cutting edge technologies such as generative AI, and quantum computing, and blockchain technologies (Krause, 2024). AI models that are generative like the GPT-4 technologies like are expected to modify financial planning by analyzing vast and complex data-set like macroeconomic indicators and behavioral pattern to deliver highly personalized investment techniques (Bengesi et al., 2024; Grant, 2024). With OpenAI at the forefront of these innovations , robo-advisors are anticipated to offer fully customized, end-to-end financial management solutions in the near future. (Salloum et al., 2024)

3.1.4.2. Core AI Application

Machine learning (ML) has a pivotal role in fintech seen by its ability to enable predictive analytics, risk assessment, and fraud detection using real time data analysis.

These practical systems become more and more effective over time. Natural Language Processing (NLP) helps customer engagement by powering sentiment and human like analysis and conversational AI tools such as chat-bots, which streamline support and personalize user interactions exemplified by platforms such as Bank of America's Erica and PayPal's AI assistant. Onabowale, O. (2024).

After taking into account efficiency, AI helps fosters financial inclusion by helping micro-finance platforms to get access to informal data and helps the under-served populations to have credit. As AI continues to globalize and change, its influence on finance will be significant, giving the fact that challenges like algorithmic bias, data privacy, and regulatory compliance must be addressed to make sure of ethical and trustworthy innovation. Onabowale, O. (2024).

3.1.5. Digital Insurance

Here we will discover that digital transformation in the insurance sector is important for many industries. Hence, it is not only viewed as an innovation phase but also most importantly as a business strategy. Digital transformation in the insurance sector need an innovation in business model that is focused on customer needs, more connected to products and services, and also emerging technologies and real-time data. In addition, also customers expect more and a near real-time relationship with the insurer for the submissions and claims and also especially for customer care. Radwan, S. M. (2019, January)

Hence, we can now defined Digital insurance as the transformation of traditional insurance services using digital technologies, leading to faster, and more accessible, and customer focused solutions. It involves everything as from online policy management to an AI-driven claims processing, changing how insurers and policyholders interact. Radwan, S. M. (2019, January)

3.1.5.1. Why it is important for the insurance sector ?

First is to *Minimise paper documents*. During digital transformation, the insurance company's reliance on electronic transactions is operated without the need to use paper in the sales of documents or the number of claims. Contracts can also be stamped and authentication with digital signatures. To this effect, international organizations need to establish a legal framework for e-commerce and to sign and pay electronically. Radwan, S. M. (2019)

Secondly, is the *narrowing the distance between companies*. When insurance companies Digitally transforms, it will lead to the narrowing of the distance between the large and small companies in regards to the production and distribution and human competencies. It will also mean that small companies can now therefore get access to the Internet so as to reach the domestic market and international markets without at the same time increase their infrastructures to keep them compete in the market. This is as a result of the use of the same method in the execution of purchases and sales, filing claims and providing various types of services electronically. Radwan, S. M. (2019)

Thirdly, *Fighting fraud is easier with technology*: Given the fact that there is an increase in the processing speed so as to provide quality and faster service to customers, we can easily notice an increase in the number of fraudsters and fraudulent claims that are not discovered by claims handling will also increase. The basis of this is data and the possibility of using enormous quantities of data very quickly and with reliable results, for example for making predictive models. It is possible to make this automated claims handling process very fast and easy to use for honest customers. Also, it is also possible to simplify processes, reduce risks and prevent and detect more fraud. 32 % of insurers now use technology for fraud prevention. 48% of insurers use it to determine the level of premiums and 45% use it to support underwriting. Radwan, S. M. (2019).

Lastly, access to *rural areas*: As we mentioned earlier, insurance companies can easily have access to individuals in less developed areas and rural areas and to provide insurance services that can't be available to them in using the normal ways and without having to relocate. (direct contact). Radwan, S. M. (2019).

3.1.5.2. Key Technologies and their application in Digital Insurance

Artificial Intelligence: Science and engineering of making intelligent machines. AI covers the process of analyzing large data for example with machine learning methods and automated decision making based on that data.

Japanese insurer Fukoku Mutual Life uses IBM's Watson Explorer for automated payout calculation (still subject to human approval). By analyzing a picture of the insured, Lapetus can estimate the relevant data for a term life policy. The conclusion of the contract can be processed much faster. Radwan, S. M. (2019)

Big Data: Large (partly unstructured) data, which generated by telematics devices, social networks, or other internet sources. It takes different data types (e.g. text, audio, video) from many data sources. Radwan, S. M. (2019)

Also, AI is used in chat-bot applications. Many insurers use text mining, e.g. for fraud detection or analysis of web content for customer acquisition 26 percent of German insurers are using big data analytics and 46% ? have developed a big data strategy. Radwan, S. M. (2019)

Internet of Things: Connected world; every element sends and receives information through sensors. It has sub-topics like telematics devices, smart home and smart factory.

Telematics devices are starting to be more integrated in health insurance (e.g. vitality program from General) and motor insurance (e.g. Progressive, State Farm). Radwan, S. M. (2019)

Blockchain: Decentralized database of all digital transactions among participants. Contracts could be stored and automatically executed (smart contracts).

Aegon, Allianz, Munich Re, Swiss Re and Zurich have founded the blockchain Insurance Industry Initiative B3i to analyze the potential. Allianz and Nephila piloted the

blockchain technology for cat swap transactions. Fizzy by AXA has developed a peer-to-peer flight insurance based on blockchain technology which pays automatically without any claim filing if a flight is delayed by more than two hours. Radwan, S. M. (2019)

Mobile devices with Apps: Smartphones/ tablets with their applications replace desktop computers. People are always online as a result of mobile internet access.

Apps are used for claims reporting (e.g. Allianz, Debeka) and sometimes for contract administration and customer service (e.g. Allstate). Insurtech Trov ?, and Lemonade use solely an app for their insurance products,. Apps can be used for a more efficient sales process. Agents and brokers can be supported by a variety of tools (e.g. electronic signature, task and time management). Radwan, S. M. (2019)

Social network (Facebook)/messenger (WhatsApp)/internet forum: Platforms for private persons and organizations to share information (statements, pictures, videos). Messenger services have replaced text messages and are starting to get more attention than social networks. Internet forums provide an easy way to get help for frequently asked topics.

Facebook is often used by insurance companies. Also some have also started to use messenger services, e.g. Ergo uses WhatsApp for customer service. Forums are used to screen feedback of customer, to intervene in case of queries, and to communicate actively with (potential) customers. Radwan, S. M. (2019)

Website: Insurers present various information on the company, the products, etc. Insurers offer policies via websites.

It is used by all insurance companies in the life and non-life segment. Also, new players that focus on online sales only (e.g. Cosmos Direct, smile. direct). First contact either via own websites or aggregators (e.g. Check 24, Compares). Radwan, S. M. (2019)

3.1.6. Open Banking

Nowadays, open banking is becoming more popularity. This is because the international economy develops very fast thereby enabling faster, more secure transactions anywhere in the globe. It also gives customers more chances to manage their accounts with the help of third parties. However the reason for this is to increase consumer power and ensuring diverse choices. As a result of more institute entering the ecosystem to with the pretext to provide more specialized and pertinent financial products and services, the open banking will locally promote innovation in addition to placing consumers at the center of the financial ecosystem. As competitions is the leads to innovation. Jha, P., & Gupta, S. (2024, January 29). Lux, M., & Zhao, O. (2025)

3.1.6.1. Definition and Core Principles

So now, it can defined as the sharing of financial data between financial institutions and third parties,using application programming interfaces (APIs: Application Programming Interface), with consumers' express consent. Also it can be seen as, the goal of open banking is to give consumers or costumers the option to allow third parties usually fintech companies to get access to their finances in order to receive improved services. Lux, M., & Zhao, O. (2025).

The API integration allows third-party providers to access financial data and perform transactions on behalf of customers through a secure API as demonstrated in figure 3.4 below.

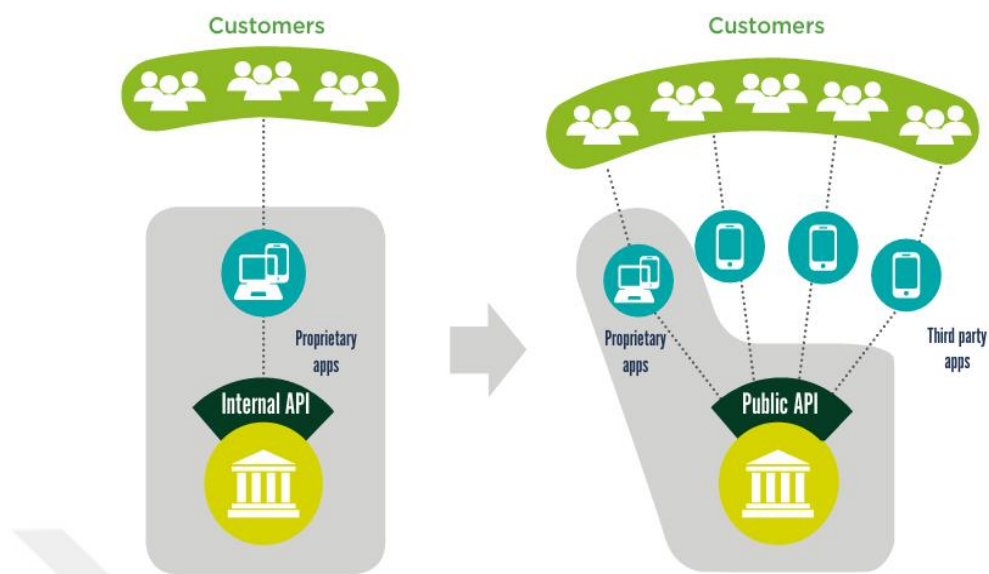


Figure 3.4. Open Banking Operation

Sources: Jha, P., & Gupta, S. (2024, January 29).

Open banking APIs fall into four main categories: *Data, Product, Secure Authentication and transaction APIs* (Finance Dispatch).

- The *Data APIs*: it gives Access to account balances and transaction history
- The *Product APIs*: It helps the comparison of interest rates, fees, and features
- The *Transaction APIs*: Initiation of payments or transfers directly from bank accounts
- And the lastly *Secure Authentication*: it Ensures user consent and data protection.

However the transformation of “Closed banking” to “Open banking” comes as a result of the introductions of new parameters and processes as demonstrated on figure 3.5 below. Open Banking transactions can be summaries in three main phases of operation.

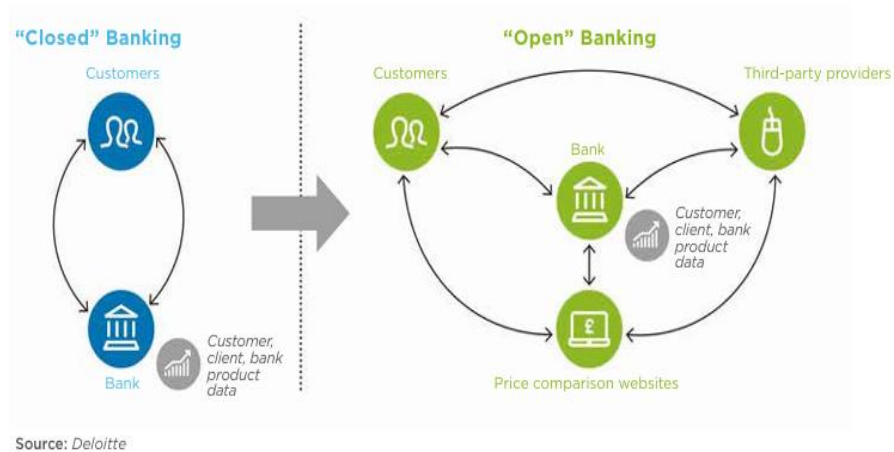


Figure 3.5. "Closed" And "OpenBanking" Tranformation.

Sources: Jha, P., & Gupta, S. (2024, January 29).

Firstly, this process has to start with customer giving his or her consent. This when an individuals gives the permissions to access to their banking data using a or a smart-phone or any secured interface.

Secondly, after the consent from the costumer is given, an API integration will permit the bank to expose the former's information through an Application Programming Interfaces (APIs). This will allow other third-party applications to communicate with the bank in real time. This third-party providers could be budgeting apps, loan platforms, or payment services.

Thirdly and lastly, those third parties use now the APIs to get the costumers account data, initiate payments, and offer financial products while taking into account the customers financial profile. While doing all these processes, data security is prioritized.

Sharing of information is mandated under regulations bodies like the General Data Protection Regulation (GDPR) in Europe and the Revised Payment Services Directive (PSD2) in the EU. The banks and third-party providers mentioned above are obliged to have a security standards so as to keep and ensure the protection of sensitive user profile information.

3.1.6.2. *The History of Open Banking*

As researchers invoke the history of Open banking when it came into existence when the European Union's Payment Services Directive (PSD2) (adopted in 2015 and enacted in 2018) was required to bring APIs for third-party access to consumer financial data (Lux & Zhao, 2025). Then United Kingdom had to apply this framework by reinforcing it through its Open Banking Standard. This led to the establishment of open banking as a legal model.

Meanwhile, in the world, open banking has undergone to phases of development: these are the *regulatory-led approach* for example in the EU and Australia and the *market-led approach* for example in India and Singapore. As for the Regulatory-led approach, data sharing is overseen by legal bodies i.e mandated or governed, while in market-led approach, the systems rely on voluntary banks participation to drive digital innovation (Lux & Zhao, 2025). It mostly profit motivated. Australia's Consumer Data Right Act (CDR), was been introduced in the year 2017, and later on expanded data-sharing beyond banking.

But also before open banking came to existence, screen scraping was mostly used by fin-tech so as to access consumer data profile, regardless of the serious privacy concern and security concerns. Screen scraping however is still in used but due to regulatory pressure its operation has seen a drastically drop and also due to the emergence of safer API-based alternatives. Some institutions now use contractual API access as a transitional solution. (Lux & Zhao, 2025).

While in the U.S., the Consumer Financial Protection Bureau (CFPB) which invoked Section 1033 of the Dodd-Frank Act, has been revitalized by President Biden's 2021 Executive Order. This aimed at formalizing open banking rules which envisage the consumer data rights and promoting competitive market. (Lux & Zhao, 2025).

Since then Open banking has seen a world wide expansion. We have countries like Australia, Canada, and Türkiye that has put into activity same frameworks. PSD2 has

always remained the backbone of open banking in Europe, driving innovation and competition (Wikipedia; Jha & Gupta, 2024).

3.1.6.3. Global Usage Of Open Banking

United Kingdom: UK has proven to be one of the world leaders in the implementation of Open Banking. The Open Banking Working Group was established in the UK in 2016. This was to regulate the terms of Open Banking. And also the Open Banking Implementation Entity (OBIE) was also established in the years 2018 to regulate the terms of Open Banking. Jha, P., & Gupta, S. (2024, January 29).

Turkey : Here in Turkey, open banking is still progressing through voluntary (i.e the *market-led* approach) initiatives, with banks launching APIs independently despite the absence of regulatory mandates. Fintech companies have been seen collaborated with banks to pursue innovative projects. This has resulting in a limited but notable roll-out of advanced products and services due to competition. Haven seen it strategic, importance FinTech Istanbul identified open banking as a key priority in its 2019 road-map. This was a result to the growing interest from banks and financial institutes, group was formed under FinTech Istanbul to explore stakeholder needs. To also see into challenges, and expectations, in actionable prescription for standardization and future development. FinTech Istanbul. (2020, February).

Australia: In Australia the government has put in place the Consumer Data Right (CDR), whereby banks are requested to open up their customer's data to authorized third-party providers. It is being put into practice in stages by stages, with the banking sector being the first to implement it. Jha, P., & Gupta, S. (2024, January 29).

Singapore: In Singapore, the Monetary Authority (SMA) is promoting the use of open APIs in the country financial sector using the API Exchange (APIX) platform. which enables financial institutions to share data and services with third-party providers. Jha, P., & Gupta, S. (2024, January 29). Figure 3.6 below shows Open-Banking usage in the world. Figure 3.6 below shows the global geographical area of the usage of Open-banking.



Figure 3.6 : Global Usage Of Open Banking

Source: Jha, P., & Gupta, S. (2024, January 29).

1. Pioneer - Heavily regulated Open Banking
2. Follower - Weaker regulated Open Banking
3. Riser - Weaker market standards
4. Beginner - First Initiatives towards Open Banking

3.2. ADVANTAGES AND DISADVANTAGES OF DIGITAL FINANCIAL TECHNOLOGIES

After going through the different types of DF technologies and after seeing and understanding the different types and categories, we can however identify their advantages and disadvantages. Below are some of them.

3.2.1. The Advantages Of Financial Technologies

Firstly, there is a *Financial Inclusion*. Digital Fintechs helps to extends access to financial services for example payments, credit, savings to those who are unbanked and under-served populations with demographic factors, especially in remote or rural areas. This helps in the contribution of economic growth and poverty alleviation (Ozili, 2023a; Schuetz and Venkatesh 2020; Chouhan et al. 2020).

Secondly, there is *Increased Efficiency and Speed* due to the automatic processes. The reduction manual errors, has allowed the real-time transactions for example, payments and transfers, leading to streamlining business operations and enhancing the speed of financial market information transmission.

Thirdly, it *Enhances Data Utilization and Personalization*. The use of data analytic and Artificial Intelligence (AI) helps to personalized financial advice, automated investment portfolios (robo-advising), and customized product offerings based on spending patterns and risk profiles (MenigaSolution; Hashika, 2017).

Fourthly , there is *Conveniency and Accessibility*. Digital Fintechs provides a 24/7 access to variation of services from anywhere using mobile devices or computers. This mitigates the need for physical branches and also saves time (Drigă & Isac, 2014; Bachas, Gertler, Higgins, and Seira, 2018).

Lastly, *Lower Costs and Competitive Rates*. Providers with high digital capabilities have lower operational overheads than traditional institutions. This can lead to lower fees, better interest rates for customers, and reduced transaction costs (Ndirangu & Kimani, 2022).

3.2.2. The Disadvantages Of Open Banking

Data Security and Privacy Risks: We can detect a potentiality for cyber-attacks. This is because the Centralized platforms has a variety of very important information of individuals. This makes those information s or data vulnerable to hacking, and data breaches, leading to identity theft and fraud. (Chen & Wang, 2023; Alpha JWC Ventures).

Digital Divide and Literacy Challenges: We see notice here that those who does not have the access to Digital fintech are vulnerable. Let that be the infrastructure or knowledge. Hence those who have these have this opportunity will create a gap between them leading to inequalities. (S. M. Riha Parvin & Niyaz Panakaje, 2022).

Lack of Human Interaction and Trust: People who prefer personal assistance and face-to-face trust building issue can be frustrated. This is due to the fact that human advisor and orientators are being replaced by chatbots platforms.

Technological Dependence and Infrastructure Gaps: As we all noticed, nowadays all the Services are depended on a stable internet connectivity and functioning technology. So, system down-times, technical glitches, or lack of technical knowledge among users can hinder access and lead to financial losses or inconvenience.

Regulatory and Systemic Risk: Also, when we see the rate at which FinTech are been developed, we might come the conclusion that it may overwhelm the regulatory bodies. This could lead to unregulated or under-regulated market segments. Also, interconnected digital systems could pose financial instability which could lead to the disruption of monetary policy and (Bank for International Settlements).

3.3. DEVELOPMENT OF DIGITAL FINANCIAL TECHNOLOGIES WORLDWIDE

3.3.1 Global Trends and Milestones

1. Early Adoption and Acceleration

Digital technologies came to play a role in finance industry during the dot-com period. Then it later on improved after the 2007 / 2009 global financial crisis. This enabled the financial institutions to use digital fintech so as to facilitated international transactions. Digital financial development later on became renowned after the global financial crisis because institutions sought efficiency and resilience (Ozili, 2023).

2. FinTech Expansion

At this stage, finTech plartform through mobile money applications , peer-to-peer lending, robo-advisors, and digital insurance has caused the traditional banking to face enormous challenges. It is realised that at this point in time investment in FinTech

became rampant around the world. With a report suggesting that mobile money users were over 1 billion individuals. While FinTech and mobile money industries top the list of beneficiaries of digital finance investments (Ozili, 2023).

3. Integration of Emerging Technologies

And later on AI and machine learning were being intergrated where they helped to detect frauds, scoring credit, and customer service. Meanwhile Blockchain provided a secure, transparent transactions and decentralized finance (DeFi). Also, IoT and cloud computing as we mentioned earlier, they support real-time data collection and scale-able infrastructure. These innovation has led to major advancement in connectivity, computing power, and usable data (BIS & World Bank, 2021).

3.3.2. Global Development

In this section, we shall review some reports regarding then global perspective of the digital fintech. Some researches suggests that there are over 2 billion unbanked adults in the world. And that; Digital financial services could increase the GDP of developing and emerging countries by US\$3.7 trillion and has the potential to create 95 million jobs across all sectors (Manyika et al., 2016).

They also suggested that; Fintech has surpassed much of the global digital finance space with global Fintech revenues rising from €92 billion in 2018 to over €188 billion in 2024. And also that; the global mobile money services have increased by 20% in transaction value in 2020 . They pointed out that; the largest increase was recorded in the East Asia and Pacific region, the Latin America and the Caribbean region and the Europe and Central Asia regions, meanwhile the sub Saharan Africans regions and the Middle East and the Northern Africa regions have recorded in regard to global mobile money services a slow growth. Ozili, P.K. (2023)

3.3.2.1. Asian Region

In the Asian regions, a McKinsey Report reported that; over 700 million consumers use digital banking regularly in Asia (Barquin and Hv, 2015). And that countries like India, Indonesia, Mongolia, Myanmar, Pakistan, and the Philippines are using digital financial services as financial inclusion project so as to improve the access to finance for the under-served (poor people and for women). Another research suggests that, there are over 775 million potential female users of mobile money in East Asia and Pacific presently. And that , two Asian countries, China and India, have the highest Fintech adoption rate in the world at 87% and 77% respectively followed by Singapore according to a Ernest and Young global Fintech adoption index 2019 report. We also see at the 2017 report of Asian Development Bank which reports that; digital financial services could increase the gross domestic product (GDP) of Asian economies by 14%, and it also has the ability to improve the GDP to as high as 32% in Cambodia which is even a smaller market. Enabling framework for the provision of payments, and the widespread use of e-money, and regulation are the main factors that led to the development of the digital finance ecosystem in Asia that allows the use of agents by both banks and non-bank entities (World Bank, 2019). Reports also suggests that regulatory arbitrage, regulatory uncertainty, incomplete schemes for the protection of customers, low financial literacy, and low technological literacy are some of the main challenges facing the Asian digital finance ecosystem. World Bank, 2019 and Ozili, P.K. (2023).

3.3.2.2. European Region

Meanwhile in European countries, we see that currently most of the investment in digital finance is invested in Fintech. Details are demonstrated as in Figure 3.7 below.

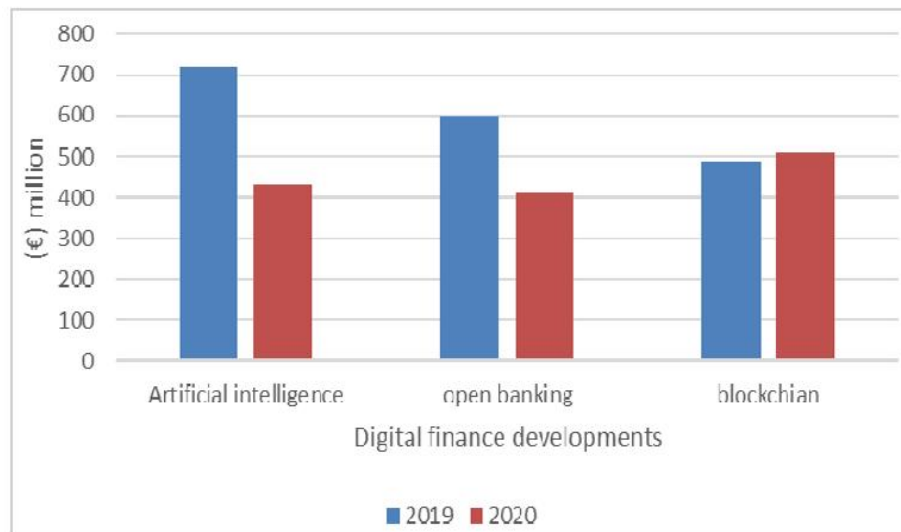


Figure 3.7. Development Of Digital Financial Technologies In Europe

Source: Ozili, P.K. (2023)

As seen on the above figure, reports suggest that ; - in the year 2020, the European Fintech ecosystem was made up of 3,482 European participants with 44% in the UK, 8 % in Germany, 6 % in Spain, 6 % in France, 5 % in Switzerland, 5 % in Netherlands and the rest 27 % were spread across the rest of the European countries (Deloitte-IIF, 2020). Also, a Finch Capital Report stated that; 5 % of European Fintech deals made up about 65 % of the total funding in the global Fintech sector . European Fintech companies raised a total of €3.52 billion in 2018. By the year 2020, the number surged by 150 % to €8.81 billion in 2019 and to approximately €10 billion. Another report suggests that ; the amount of funding invested in AI surpassed €750 million in 2019 and later on dropped to approximately €400 million in 2020 due to the COVID pandemic. Meanwhile the total amount of funding that was invested in open banking systems was over €400 million in 2019 and approximately €500 million in 2020.

3.3.2.3. African Region

And finally in Africa regions, the rise of digital finance was perceived in the early 2005 (AFR, 2021). GDI, (2021) reports in the year 2021, 514 Fintech companies offering digital financial services across the African continent were present . Where 98 of them have received over US\$100,000 and just 50 companies have received funding

more than US\$1 million. Among these companies a total investments made across the continent, 70% (US\$823m) of the investments are mainly for payment solutions like the mobile money payment solutions (AFR, 2021). GSMA, (2021) reported that in the year 2020 alone, Africa witnessed 171 mobile money services, 562 million registered users, 161 million active accounts, 27.4 billion in transaction volume and US\$490 billion in transaction value. While West Africa and East Africa countries recorded the highest improvement in mobile money adoption in the entire African continent according to data obtained from GSMA. However, challenges faced by the main actors in the African digital finance ecosystem are the issues of low fund-raising, regulatory challenges, lack of understanding of the local digital finance market and the difficulty in finding talent. Ozili, P.K. (2023).

CHAPTER 4: FACTORS AFFECTING MULTIDIMENSIONAL DIGITAL FINANCIAL LITERACY.

4.1. LITERATURE REVIEW

This section presents a critical review of the existing literature on the concepts of financial literacy (FL) and digital financial literacy (DFL), spanning Global perspectives and specific contexts in Türkiye and Cameroon. The synthesis of these findings will establish the foundation for the study and logically lead to the determination of the research problem and the identification of a significant gap in the literature.

4.1.1. A Review of Financial Literacy and Digital Financial Literacy in the world.

Gumbo, L. (2025), by using bibliometric content, and thematic analyses, published an article which made a literature review on DFL while taken into case study the synthesis of 83 studies that were being published between the year 2020 and the 2025. In this article, Gumbo pointed out the importance of DFL after the pandemic COVID-19 in the global financial system. This was as the result of the development of the financial platforms by the innovations such as the e-payment systems, robo-advisors, cryptocurrencies, and blockchain technologies that demanded new competencies and knowledge to be operated as a result. Gumbo went further in the article to identify five major dimensions of DFL which are :- digital financial knowledge, behaviour, attitude, risk management, and access or utilization of digital financial services. While mentioning the OECD toolkits review, the study made an emphasis on the less representation of developing nations in the DFL research sphere, which made a call for more inclusive studies to ensure global financial resilience and inclusion. Moreover, this study contributes to the valuable synthesis in the domain of financial research studies and also proposed the integration of DFL as a backbone of the FL and policies.

Huston, S. J. (2010), also made a synthesis on 71 studies on FL published between 1996 and 2008. Where in the review, she critically analyzed the terms “financial knowledge” and “financial literacy” as being inter-changed and inconsistently defined.

Huston went further to underline FL into four main aspects :- money basics, borrowing, saving or investing, and protection- while pointing out the methodological variation in the measurement instruments. She proposed that the concept of FL should be defined as both understanding and application of personal finance information (*constructs like* health literacy). Her study proposes a global standard measures to improve education evaluation and link education to financial well being.

Kaiser, T., & Lusardi, A. (2024) made a study and an overview on FL, where they demonstrated continues global low literacy level while also pointing out the demographic disparities in age , gender, minority groups and education. In their publication, they addressed the reliability of the “Big Three” concepts which are:- risk diversification, compound interest and inflation- as the reliable measuring tools for FL. The publication also correlates debts managements, retirement planning, savings and investment to FL and also stated endo-geneity among the methodological challenges. In their evaluation results on financial education program, they found a mixed but an overall positive effects. Hence, they proposed a stronger causal identification, an inter-sectional analyses and better instruments in future research.

In another study carried out by Xu, L., & Zia, B. (2012) on a general overview of FL, they confirmed a low level of FL in both the developing and developed countries in general, and a poor outcome in low income triggered by financial exclusion in particular. They also used the “Big Three” questions by Kaiser, T., & Lusardi, A. (2024) (risk diversification, compound interest and inflation) to figure out an increase gap in income, gender, age, and education. They also highlighted the in low income countries, FL is regarded in terms of access to finance, entrepreneurship and insurance. While on the other hand, in high income countries, FL is related to debt management and retirement planning. In their research studies they found out a mixed effectiveness on the financial education programs and while being very demanding. And they concluded by recommending a better measurement, a standardised education plan and integration into development strategies.

In another study carried out by Mishra, B. R., & Malik, S. K. (2025), where they made an overview on the global FL and defined FL as “ the ability to understand and

apply financial concepts in budgeting, investing, saving, credit management, and risk mitigation”. Also in this study, the disparities in those regions shaped by culture, education, and technology were identified. As a result a five-dimensional index which include;- knowledge, attitude, behavior, skill, and awareness- to measure FL were given as a proposition. The study also made a finding on the vulnerability to fraud and reduced economic growth which are all caused as result of financial illiteracy. By doing so, they also made a review on global initiatives and digital platforms that are promoting education. And they concluded by saying that FL is very important for FI and financial resilience.

In another synthesis made by Yadav, M., & Banerji, P. (2023), they carried out a synthesis study and thematic analyses to analyse 158 publications on DFL from the year 2015 to the year 2022 using bibliometric tools. The key themes in this publication include:- fintech adoption, saving behavior, retirement planning, and consumer protection. Their study yield the result where by early studies were mostly focused on socioeconomic and demographic factors of DFL while on the other hand recent studies focused on risk management, behavioral influences, and financial inclusion. They also found out that although the global representation of DFL not even, countries like China, India and other ASEAN countries emerged as the leading participants in DFL. At the end they proposed an integration of a significant inter-disciplinary collaborations and the integration of digital literacy into financial education.

4.1.2 A Review of Financial Literacy and Digital Financial Literacy in Turkey

However, the review of many academic articles on DFL and FL in Turkey reveal that the former are becoming an important topic in Turkey’s economy. This is as the result of the many publications examining their levels, determinants, and impact in the Turkish economy. While these studies are national initiatives to improve these skills, Turkey faces unique opportunities and challenges as well.

In a study made by Çalışkan, M. M. T. (2024), where the study mostly focused on blockchain, cryptocurrencies, online investments, and digital payments to examine DFL.

In the studies, Çalışkan made a demonstration in the chapters where traditional FL is being distinguished from DFL which integrates digital tools, cyber-security, and technical knowledge. Turkey was being taken as a case study where the challenges like low literacy, gender gaps, and misinformation in crypto-markets and a opportunities like mobile banking adoption. The study at the end made emphasis on financial inclusion and sustainable digital participation which could be enhanced by education, cybersecurity awareness, and targeted support for vulnerable groups and which as a result improve DFL.

Bilici, M. R., & Çevik, S. (2023), in their study made an analysis on the relationship that exists between FL and Cash Holding by considering Turkish households as their sample using the Methods of Payment Survey. They also used the “Big Three” financial literacy framework:- interest rate, inflation, and risk diversification- and analyse their responds in three literacy group. From their results, those individuals with high FL level held less cash in hands, and kept some cash somewhere from precautionary motives, switched to non-contact payment method during the COVID-19 pandemic, and owned more credit and debit cards. The research concluded that FL reduces cash usage at points of sale but also on the contrary, increases the demand for cash as precautionary motive .

In another study by Özyeşil, M., & Tembelo, H. (2025), a survey on 600 Pharmacy Faculty students in Istanbul was made analyse the relationship between digital financial literacy and financial behaviors. They used the Structural Equation Modeling (SEM) to analyse the the correlation between financial knowledge, attitudes, behaviors, and their digital counterparts. The study revealed a very strong correlations that exists between financial knowledge and both digital financial attitudes and behaviors. And that digital financial attitudes influences digital financial behaviors and financial attitudes predicts financial behaviors. Most of the students depend on the internet (94.7%) for their first -class information in financial information and their family has influences on their spending behaviour. Also the sample are more orientated to digital banking (92.5%) than credit card usage (57.7%).

The study of Düzakın, H., & Yılmaz, S. (2021), also examined the factors that influences FL among Turkish households while using a sample of 1,000 individuals in 12 provinces. They used the logit regression model where they analyzed the impact of demographic factors and socioeconomic variables on FL. As a result, 52.9% of the Turkish house holds where financially literate. Demographic factors like gender, age, and education showed statistically significant predictors while men, older people and those having higher education showed higher FL. The study took into account the three components of FL which are;- financial knowledge, financial attitudes, and financial behaviors.

4.1.3 A Review of Financial Literacy and Digital Financial Literacy in Cameroon

DFL and FL are vital for the economic development and the emergence project of 2035 by the state of Cameroon. As this emergence and the economic development will be enhanced by the international trade, individuals and companies are forced to adapt to the dynamic financial platforms and new financial technologies. As such, economic intellectuals are bound to make researches and publications so as to orientate individuals, financial institutions, economic agents, the pedagogy and policy makers on how to face these challenges by giving propositions and tailored solutions.

As such, Lontchi, C. B., Yang, B., & Su, Y. (2022) made an investigation to determine how FL and social capital shape the relationship between FI and sustainable development (SD) in Cameroon. In this exercise an analysis of 488 survey responses from Douala and Buea municipalities was analysed using the PLS-SEM model. The analysis proved that FI is positively correlated to both FL and SD and that FL is a mediation of the FI and SD relationship strengthening both their direct and indirect effects. They went further to prove that social capital despite the fact that it is positively related to SD, it does not mediate the FI and SD relationship. Also they stipulated that cash holdings and financial behaviors are influenced by demographic and socioeconomic factors. In conclusion, they showed that FL is an important mediator of SD through FI and social capital is just supportive and non moderator.

In another study, Esowe, S. L., Cho, M. N., & Iso, A. V. N. (2017) made an investigation the Cameroon capital Yaounde on how FL helps in poverty relief. A mixed method was used after administering a questionnaire to 100 workers and giving interviews with 20 retirees. As a result they found out that most of the participant workers are not aware of financial instruments such as mobile money², treasury bonds, and debit cards. And that most of the participants meshed in a haphazard borrowing without even taking into account retirement planning whereby 86.8% of them said they never attended retirement seminars. They further found out that income level do not strongly correlate to savings or investments indicating that knowledge gap drive poor financial results instead of income and higher educations are positively correlated to FL. As such they concluded that FL is the main factor that influences financial sustainability and poverty reduction.

Takemeyang, A., Ketuma, H. J., & Akpor, T. A. (2025) in another study examined how DFL can influence the intention of a customer to adopt AI-driven digital finance services while using customer value proposition (CVP) as a mediator variable. They administered surveys to 466 Cameroonian banking customers and they used the PLS-SEM model to analyse. As a result they found out that DFL affects the CVP dimension. While taking into consideration functional, economic, emotional, and symbolic value. They also found out that the relationship between DFL and adoption intention is mediated by CVP dimension. In conclusion, they suggested that banks should always take into account customer-centric strategies and that governments to promote DFL programs so as to enhance the integration of digital financial services.

Benlamine, M., & Tressel, T., (2022) also examined the relationship between fintech development and FI in Cameroon and expanding their analysis the rest of the Sub-Saharan African region. They study stipulated that the solution to reducing poverty, improving household consumption, and supporting small firms all lies on the framework

² This should be an old analysis in 2017. As mobile money accounts has become a main financial tool in Cameroon. Check my review on "...They further found out that in Cameroon, the access to Mobile Money has increased from 4 per km² in 2014 up to 230 in 2020 and mobile money transactions reached approximately 55% of GDP by 2020...". Benlamine, M., & Tressel, T. (2022).

of FI. They further found out that in Cameroon, the access to Mobile Money has increased from 4 per km² in 2014 up to 230 in 2020 and mobile money transactions reached approximately 55 % of GDP by 2020. However despite this strive, Cameroon is still lagging behind compared to other in terms of Sub-Saharan averages in utility payments and wage transfers via mobile money. Having access to traditional banks is quite limited whereby only 2.15 branches per 100,000 adults compared to a regional median of 4.02. However micro-finances make up the gaps significantly and mobile money can only be a substitute to lending rather than a complement. Correlation analysis confirms that, owing to private sector credit elasticity estimated at 0.36, there will be in the future a positive correlation between financial development and economic growth.

4.2. PURPOSE AND IMPORTANCE OF THE STUDY

Haven gone through the different publications and writing on DFL and FL in the World, Cameroon and Turkey, it can be admitted and confirmed that FL and DFL are the main actors of FI and sustainable developments. As such, in emerging economies like Cameroon and Turkey, there is a presence of inadequate comparative evidence on DFL mediates financial behaviors and inclusion outcomes. Therefore, this gap necessitate an inter-country analysis to understand the cohesion between traditional literacy, digital literacy, and socio-economic development.

As a result, the primary main objective of this present study is to determine the Factors Affecting the Multidimensional Digital Financial Literacy in Cameroon. This can be achieved by answering the questions posed as;

How do socio-demographic factors such as age, gender, level of education, income, and occupation affect an individual's financial literacy?

What is the role of access to financial services (e.g., bank accounts, mobile money, and microfinance institutions) and digital financial technology in influencing financial literacy?

How do cultural norms and a reliance on informal financial systems (e.g.,

"tontines"³ or informal savings groups) impact formal financial literacy and behavior?

What are the primary challenges to the implementation of financial education programs in Cameroon, and what policy recommendations can be made to improve financial literacy at a national level?

This research will help to improve the academia literature in DFL and DL in Cameroon. And also policy makers and educators could use this notions to improve their policies on Education and Financial Inclusion.

4.3. METHODOLOGY AND DATASET

A quantitative approach was used where online structural questionnaires were conducted and shared to family members and friends for further transmissions. Structural questionnaires were printed and administered in December 2024 to February 2025 to students and clients in my job-site at the Savanah Islamic finance Microfinance and in my former university the University of Yaounde 2 Soa respectively through my esteemed Professor. A total of 800 questionnaires were printed for the university and the Micro-finance. And also 10 online responses were received by e-mails. 148 copies were found irrelevant which all sum up to a sample space of N=662.

The questionnaire included 5 main sections; the demographic, financial literacy, digital financial literacy, Cybersecurity Awareness and Attitudes and barriers sections respectively. And it was made up of Yes ,No and tentative questions and opened ended questions as well to ensure that everyone answered the same way and same answer. I personally created the questionnaire using the pilot testing method as most of the people were skeptical and avoiding complicated questions and answers hence straight forward

³ Tontine in Cameroon is a traditional fund mobilisation scheme. Where each individual in that organisation contributes to one person a certain amount of money at a given time period and that same persons will also participate in contributing that same amount at a stated time to another participant in that same organisation till it goes round and back to his turn. Fair Observer. (2021). Tontines. Retrieved from <https://www.fairobserver.com>

questions and answers. The survey comprised of French and English version where the personal information of the participants are all consented.

The analysis was conducted using *IBM SPSS statistics v31.0.0*. Descriptive statistics were first carried out then followed by Inferential Statistics operations.

The sample size 662 was too small to achieve a minimum error margin and a maximum expectation rate given the population size of about 30 million in Cameroon. Most of the respondents answered the survey without taking it serious as fear of their personal consents.

4.4. RESEARCH FINDINGS

This research examines various factors influencing digital financial literacy in Cameroon, considering aspects such as; *Education Level, Income, Financial Knowledge, Access to Financial Services, Digital Financial Experience, and Security Awareness*. It can be expressed mathematically as follows:

$$DIG_FI_LIT = \beta + \sum_{j=1}^k \beta_j X_{ji} + \epsilon_i$$

$j = 1, 2, 3 \dots k$ ($k = 9$) $i = 1, 2, 3 \dots n$ ($n = 662$). Where

With X_{ji} , the explanatory variable j associated with Respondent i , β_0 , the constant term; β_j , the estimated coefficient; n , the number of observations or sample size; k , the number of explanatory variable (main and control variables) and ϵ_i , the error term. The empirical form of the model or the specific model that analyzes the relationship between financial literacy and Fintech is as follows:

$$DIG_FIN_LIT = \beta + \beta_1. (Know_Fintech) + \beta_2. (Income\ level) + \beta_3. (Saving\ habit) + \beta_4. (Gender) + \beta_5. (Education\ level) + \beta_6. (Income\ level) + \beta_7. (Saving\ habit) + \beta_8. (Access\ to\ financial\ services) + \beta_9. (Age) + \epsilon.$$

4.4.1. Demographic Data

The demographic data of the respondents during the survey was taken. It comprises their ages, gender, level of education, education level, residency, occupations, and income level. This section will also use data from *Table 4.14.* below to determine the summarizes coefficients. The results of each demographic factor is analysed as follows;

During the survey, the participants gender was carefully taken into consideration whereby a male : female ratio has to be observed so as not have a greater gender disparity. Whereby after a male or two is or are given the survey a female becomes a priority for the next participant. That led to the results in table 4.1 below. This helped to underline the a maximum point of view of the two genders in the total survey. Here 1 was randomly chosen to represent a male and 2 a female without any aim of discrimination or merit.

Table 4.1. Gender Frequency Table

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	345	34,6	52,1	52,1
	2	317	31,8	47,9	100,0
	Total	662	66,4	100,0	
Missing	System	335	33,6		

This gender frequency distribution gives a good foundation for comparative analysis. The male gender with 52,1% was slightly greater than the female with 47,9% in the survey. However, as shown in the results:

Gender was not a statistically significant predictor of DFL ($B = -.049$, $p = .582$) *see table 4.14. below.* As a result, gender alone cannot not explain variation in DFL, which corresponds with the studies that argues behavioral and contextual factors over demographic ones (Lyons & Kass-Hanna, 2021; Koskelainen et al., 2023) in the above chapters.

Nevertheless, gender is still a very vital factor in this research as digital access, financial autonomy, or fintech trust may differ by gender (Stephen, 2022; OECD, 2017).

The results of the level of education was obtained as shown on the table 4.2. below of the N = 662 participants. Where the frequency distribution is one way or the other balanced in the education levels.

Table 4.2. Education Level Frequency Table

Education level					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No formal education	140	14,0	21,1	21,1
	Primary	127	12,7	19,2	40,3
	Secondary	131	13,1	19,8	60,1
	Tertiary	136	13,6	20,5	80,7
	Graduate	128	12,8	19,3	100,0
	Total	662	66,4	100,0	
Missing	System	335	33,6		
Total		997	100,0		

No formal education with 21,1%⁴ has the highest frequency while , tertiary followed with (20,5%) and secondary education (19.8%). Graduate-level frequency represents 19,3%, showing a significant representation in the sample (those survey carried out in the university). This diversity in education shows a very high impact. The tertiary level has normally higher financial awareness and digital engagement (OECD, 2017; Morgan et al., 2019).

Nevertheless , these results shows that Academics was also not a statistically

⁴ This doesn't mean all these participants are illiterates. They can read and write just that they could have just the first school leaving Certificate or below which is insignificant to be an educate nowadays. That also confirms the low level of education level in Cameroon as has been argued by researchers. UNESCO Institute for Statistics. (2023).

significant predictor of DFL ($B = .016$, $p = .618$) *see Table 4.14. below*, meaning educational level only cannot verify the level of DFL in the case of Cameroon. This justifies the recent literature emphasizing experiential learning, digital exposure, and behavioral having stronger predictors than formal education (Koskelainen et al., 2023; Meoli et al., 2022).

The next is the income level demographic factor seen in table 4.3, among the 662 valid responses, income levels were evenly distributed across low (35,6%), medium (32,2%), and high (21,4%) categories. Details are seen below.

Table 4.3. Income Level Frequency

Income level					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low	236	23,7	35,6	35,6
	Medium	213	21,4	32,2	67,8
	High	213	21,4	32,2	100,0
	Total	662	66,4	100,0	
Missing	System	335	33,6		
Total		997	100,0		

These results mean that most of the population fall below income level meaning they have a low standard of living and which also indicates low savings.

Income level is the most factor that determines DFL. However, our results show that salary was not a statistical significant predictor of DFL ($B = -.081$, $p = .132$) *see Table 4.14. below*. As a result only income can not explain the variation in DFL. This can correlate with the findings made by Morgan et al. (2019) and Panos & Wilson (2020) which impose behavioral and contextual factors over economic status.

Nevertheless, income level can variate with other variables such as digital access and affordability. For example lower-income individuals may not afford fintech products.

Variables such as financial behavior spending, saving, and risk tolerance may vary by income. Trust in financial systems also can be another variance because income may influence perceptions of financial institutions and digital platforms. perceptions or concepts support the need for targeted financial education strategies that go beyond income-based assumptions (OECD, 2017; AFI, 2021).

Furthermore, looking at the employment level (activity or occupation), it is quite important to mention that the Unemployed form the largest group (23.0%) in the survey, followed by self-employed (20.1%) and Employed (19.8%). students and retired respondents are nearly equal, each around 18%. details are in table 4.4. below.

Table 4.4. Employment Status

Employment status					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Employed	132	13,2	19,9	19,9
	Self-employed	133	13,3	20,1	40,0
	Unemployed	152	15,2	23,0	63,0
	Student	123	12,3	18,6	81,6
	Retired	122	12,2	18,4	100,0
	Total	662	66,4	100,0	
Missing	System	335	33,6		
Total		997	100,0		

Here it can be seen that a diverse distribution sample in the different aspect of occupations was made. Whereby most of the participants are unemployed which describes the real situation in Cameroon. Students and retired personnel are the lowest which is logically true.

As such employment status can influence digital financial literacy in several ways. Students and unemployed individuals may have limited or even no financial engagements or experience. But however, they could have a higher digital engagement. This will be especially among the youth (Stephen, 2022) while at the same time retired

individuals may have a good financial experience but lower digital knowledge and or adaptability.

Those who are Self-employed often engage with digital financial tools for transactions and budgeting, potentially enhancing their digital financial literacy (Koskelainen et al., 2023).

However, these results did not include employment status as a direct predictor. This suggests that while employment status may shape financial behavior, its influence on DFL may be made by other factors such as activity level, education, or income levels.

As for residency or location which is presented in table 4.5 below, it has been realized that the sample is almost evenly distributed between those who live in urban areas and those who live in rural areas. Rural residents slightly outnumbered urban ones, making up 55,4% of valid responses with 44,6% respectively.

Table 4.5. Residence

Residency					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Urban	295	29,6	44,6	44,6
	Rural	367	36,8	55,4	100,0
	Total	662	66,4	100,0	
Missing	System	335	33,6		
Total		997	100,0		

Most of those who participated in the survey live in rural areas as seen in the result of the survey. This would probably be due to the fact that the university of Yaounde 2 Soa where part of the survey was carried is located in a rural settlement and also some of the participants in the financial institutions also live in rural areas due to high standard of living in urban areas and high unemployment rates.

Urban areas residents are accessible to infrastructure like fintech financial

institutions and other financial services . Mean while rural area residents may face challenges such as limited internet connectivity, lower digital exposure, and fewer financial education opportunities (AFI, 2021; Moenjak et al., 2020).

And finally among the demographic factors in the survey is the age of the participants. For each participant it was required for him or her to provide a specific age so as to save time and avoid running away from the survey activity. The results as seen in table 4.6. below shows that the participant are mostly of youth age.

Table 4.6. Age Frequency Table

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18	13	1,3	2,0	2,0
	19	11	1,1	1,7	3,6
	20	14	1,4	2,1	5,7
	21	14	1,4	2,1	7,9
	22	22	2,2	3,3	11,2
	23	14	1,4	2,1	13,3
	24	13	1,3	2,0	15,3
	25	14	1,4	2,1	17,4
	26	12	1,2	1,8	19,2
	27	16	1,6	2,4	21,6
	28	16	1,6	2,4	24,0
	29	17	1,7	2,6	26,6
	30	10	1,0	1,5	28,1
	31	13	1,3	2,0	30,1
	32	14	1,4	2,1	32,2
	33	16	1,6	2,4	34,6
	34	10	1,0	1,5	36,1
	35	20	2,0	3,0	39,1
	36	13	1,3	2,0	41,1
	37	20	2,0	3,0	44,1
	38	10	1,0	1,5	45,6
	39	16	1,6	2,4	48,0

Continuation Table 4.6.

	40	12	1,2	1,8	49,8
	41	20	2,0	3,0	52,9
	42	24	2,4	3,6	56,5
	43	14	1,4	2,1	58,6
	44	14	1,4	2,1	60,7
	45	21	2,1	3,2	63,9
	46	20	2,0	3,0	66,9
	47	19	1,9	2,9	69,8
	48	17	1,7	2,6	72,4
	49	12	1,2	1,8	74,2
	50	20	2,0	3,0	77,2
	51	16	1,6	2,4	79,6
	52	11	1,1	1,7	81,3
	53	13	1,3	2,0	83,2
	54	15	1,5	2,3	85,5
	55	15	1,5	2,3	87,8
	56	25	2,5	3,8	91,5
	57	14	1,4	2,1	93,7
	58	18	1,8	2,7	96,4
	59	9	,9	1,4	97,7
	60	15	1,5	2,3	100,0
	Total	662	66,4	100,0	
Missing	System	335	33,6		
Total		997	100,0		

From the survey data taken above, total respondents N= 662 provided a valid age data, with ages ranging from 18 to 60 years. The average age was 39.08 years, which shows that the participants are matured likely engaged in making financial decisions. The age was relatively balanced distribution, and having a concentration in the 25 to 45 age range. This age demographic structure supports the importance of the digital financial literacy analysis. This is so because these age groups are active in digital and financial platforms. At the age 30, cumulative answers are 28,1% of the sample. And at age 40, cumulative answers is 49,8%, showing that there exist a balanced in the younger and middle aged adult.

The distribution continues to be steady up to 60 years. This age distribution suggests a *diversity*. This Diversity plays an important role in the digital financial literacy analysis, because age often correlates with digital exposure and comfort because younger people have a good foundation in Digital financial knowledge, and the older people would like to use a traditional financial tools (Lyons & Kass-Hanna, 2021).

Also, when financial experience is mentioned, it is obvious that people with middle age may have more complex financial portfolios, affecting their literacy levels (OECD, 2017). Learning preferences and age can affect receptiveness to digital financial education formats (Stephen, 2022).

However, as shown in the regression results in *table 4.14 below*, age was not statistically significant to predict DFL ($p = .754$ and $B=.001$). This reinforces the idea that behavioral engagement (e.g., activity level) may be more influential than chronological age alone. Below in table 4.7. the summary of the entire demographic tables is made for a easy and analysis.

Table 4.7. Summary Of Demography

	Descriptive Statistics				
	N	Minimum	Maximum	Mean	Std. Deviation
Age	662	18	60	39.08	12.726
Gender	662	1	2	1.46	.499
Educationlevel	662	0	4	1.97	1.393
Incomelevel	662	1	3	2.00	.826
Employementstatus	662	1	5	3.08	1.391
Residency	662	1	2	1.51	.500
Valid N (listwise)	662				

The *Age* factor on the above table shows that the average age of interviewee is 39.08 years, with a wide range from 18 to 60, showing a variety or complex adult sample.

And *Gender* factor where with a mean of 1.46 where the coded 1 = Male and 2= Female reflects an almost balanced sample as seen the precedent frequencies.

While *Education Level* has a mean of 1.97 (having a scale from 0 = No formal education to 4 = Graduate), the sample leans toward secondary to tertiary education, supporting a moderately educated population.

And *Income Level* has a mean of 2.00 where 1 = Low, 2 = Medium, 3 = High this suggests that there is a balanced income distribution, with no strong skew toward any end.

And in the the *Employment Status* here the mean of 3.08 on a scale from 1 = *Employed* up to 5 = *Retired*, illustrates a concentration around *student* and *unemployed* categories, which is in accord with earlier frequency data.

Finally, looking at the *Residency*, it has a mean of 1.51, where 1 = Urban area and 2 = Rural area confirms a nearly equal split between urban and rural answers.

In table 4.8. below, the Comprehensive Frequency Distribution Summary can be seen for the remaining of the survey questions.

Table 4.8. Summary Of Frequency Distribution

Variable	Response	Frequency	Percent	Valid Percent	Cumulative Percent
FL1	Yes	331	33.2%	50.0%	50.0%
	No	331	33.2%	50.0%	100.0%
FL2	Yes	351	35.2%	53.0%	53.0%
	No	311	31.2%	47.0%	100.0%
FL3	Increase in prices over time	225	22.6%	34.0%	34.0%
	Decrease in prices over time	232	23.3%	35.0%	69.0%
	Not sure	205	20.6%	31.0%	100.0%
FL4	Always	199	20.0%	30.1%	30.1%
	Sometimes	233	23.4%	35.2%	65.3%
	Never	230	23.1%	34.7%	100.0%
FL5	Yes	226	22.7%	34.1%	34.1%
	No	228	22.9%	34.4%	68.6%
	Occasionally	208	20.9%	31.4%	100.0%
DFL1	Yes	334	33.5%	50.5%	50.5%
	No	328	32.9%	49.5%	100.0%
DFL2	Very confident	211	21.2%	31.9%	31.9%
	Somewhat confident	233	23.4%	35.2%	67.1%
	Not confident	218	21.9%	32.9%	100.0%
DFL3	Yes	307	30.8%	46.4%	46.4%
	No	355	35.6%	53.6%	100.0%
DFL4	Yes	320	32.1%	48.3%	48.3%
	No	342	34.3%	51.7%	100.0%
DFL5	Yes	327	32.8%	49.4%	49.4%
	No	335	33.6%	50.6%	100.0%

Continuation of Table 4.8.

Variable	Response	Frequency	Percent	Valid Percent	Cumulative Percent
CSA1	Yes	215	21.6%	32.5%	32.5%
	No	218	21.9%	32.9%	65.4%
	Not always	229	23.0%	34.6%	100.0%
CSA2	Yes	326	32.7%	49.2%	49.2%
	No	336	33.7%	50.8%	100.0%
CSA3	Yes	330	33.1%	49.8%	49.8%
	No	332	33.3%	50.2%	100.0%
CSA4	Yes	338	33.9%	51.1%	51.1%
	No	324	32.5%	48.9%	100.0%
CSA5	Yes	329	33.0%	49.7%	49.7%
	No	333	33.4%	50.3%	100.0%
AB1	Yes	154	15.4%	23.3%	23.3%
	No	168	16.9%	25.4%	48.6%
	Somewhat	171	17.2%	25.8%	74.5%
	On condition	169	17.0%	25.5%	100.0%
AB2	Lack of knowledge	177	17.8%	26.7%	26.7%
	Fear of Fraud	162	16.2%	24.5%	51.2%
	Poor internet access	165	16.5%	24.9%	76.1%
	High transaction fees	158	15.8%	23.9%	100.0%

For the variable annotation see the appendices B (the survey questionnaire) which refers to the different factor questions in the survey during the exercise.

As such, to determine the three most positive responses and the more negative responses from the participants, a descriptive statistics analysis was made. This is shown

in table 4.9. below. And data on table 4.7. above was also used to determine the percentages of the participants in the survey.

Table 4.9. Survey Questions Descriptive Statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
FL1	662	Yes	No	1,51	,500
FL2	662	Yes	No	1,51	,500
FL3	662	Increase in prices over time	Not sure	2,01	,816
FL4	662	Always	Never	2,01	,817
FL5	662	Yes	Occasionally	2,04	,819
DFL1	662	Yes	No	1,50	,500
DFL2	662	Very confident	Somewhat confident	1,97	,838
DFL3	662	Yes	No	1,47	,500
DFL4	662	Yes	No	1,47	,499
DFL5	662	Yes	No	1,50	,500
CSA1	662	Yes	Not always	2,00	,818
CSA2	662	Yes	No	1,53	,500
CSA3	662	Yes	No	1,50	,500
CSA4	662	Yes	No	1,50	,500
CSA5	662	Yes	No	1,47	,500
AB1	662	Yes	On condition	2,54	1,107
AB2	662	Lack of knowlege	High transaction fees	2,53	1,118
Valid N (listwise)	662				

From the above table 4.9, the three most positive responses chosen by the participants are as seen below;

The statement DFL3 (mean is 1.47 and SD is .500) where most of the respondents of 53.6% chosed the answer “No” (check table 4.4.7) . Then followed by

DFL4 (Mean is 1.47 and SD is 0.499) where most of the respondents of 51.7% chose the answer “No”. Then followed by the statement CSA4 (Mean is 1.47 and SD is 0.500) where most of the respondents of 51.1% chose the answer “yes”.

And the three most negative responses that are being displayed on the above table are seen as follows;

The statement AB1 (Mean is 2.54 and SD is 1.107) where 25.8% of the respondent chose “Somewhat” as their answers. Then the statement AB2 (Mean is 2.53 and SD is 1.118) where 26.7% of the participants selected the answer “lack of knowledge”. And the statement FL5 (Mean is 2.04 and SD is 0.819) where 34.4% of the interviewee selected “No” as their responses.

4.4.3. Factor Value Analysis:

Table 4.10. KMO And Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		,494
Bartlett's Test of Sphericity	Approx. Chi-Square	118,055
	df	105
	Sig.	,181

Here it can be noticed that the KMO = 0.49 and less than the minimum value (< 0.50) indicating that the sample is inadequate for factor analysis (weak correlation among the items). the Bartlett's Test ($p = 0.181$) is above the minimum (> 0.05) which indicates that the test is not significant. This indicates that the questions in the survey were all analyzed individually as it was stated earlier.

The Varimax rotation extracted four components that are all loading as seen on table 4.11. below.

Table 4.11. Varimax Rotation

Rotated Component Matrix ^a				
	Component			
	1	2	3	4
CSA2	,623			
CSA3	,514			
DFL4	,454			
DFL3	-,392			,315
DFL1		,565		
FL1		-,498		
CSA4		-,480		
FL2		,428	,324	
DFL2		,356	-,316	
CSA1			,625	
FL5			,368	
FL4				
FL3				,691
DFL5				,536
CSA5	-,300			,322
Extraction Method: Principal Component Analysis.				
Rotation Method: Varimax with Kaiser Normalization. ^a				
a. Rotation converged in 6 iterations.				

It can be seen on the table that the factor loadings are weak and quite dispersed on the table. However component 4 had some positive loadings (FL3, DFL5) but the other three remaining components did not give and interpreteable loadings. As conclusion this shows a weak correlation among these items in the survey.

4.4.4. Scree Plot and Factor Structure

The scree plot on figure 4.1 below shows a gradual decline in eigenvalues from Component 1 to Component 15, with no sharp "elbow" point.

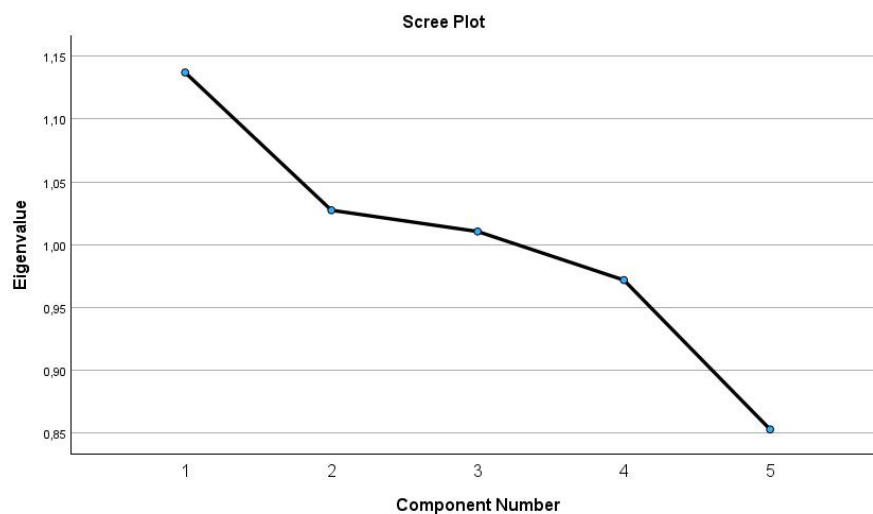


Figure 4.1 : Scree Plot and Factor Structure

Eigenvalue range: ~1.15 down to ~0.85.

No dominant component: Indicates a diffuse factor structure

Kaiser criterion: Suggests retaining the first 3 to 4 components with eigenvalues > 1.

This supports the argument that that the DFL is multidimensional, comprised of many interacting factors like digital access, fintech familiarity, trust, and financial behavior (Koskelainen et al., 2023; Lyons & Kass-Hanna, 2021; Jain, 2022).

Table 4.12. Total Variance Explained

Component t	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.287	7.570	7.570	1.239	7.291	7.291
2	1.243	7.310	14.880	1.237	7.274	14.565
3	1.223	7.194	22.074	1.227	7.218	21.783
4	1.160	6.824	28.897	1.209	7.115	28.897

Extraction Method: Principal Component Analysis.

From the result above it can be realize that the results supports the argument that

digital financial literacy is multidimensional, consistent with our scree plot and theoretical framework.

No single component has dominated, suggesting that DFL is influenced by multiple latent factors such as digital access, financial behavior, trust in fintech, and education (Koskelainen et al., 2023; Lyons & Kass-Hanna, 2021).

The relatively low cumulative variance indicates that additional factors—possibly behavioral or contextual may be needed to fully capture the construct.

The ANOVA test in the Table 4.13. below was further carried out to determine if there is a statistically significant differences between the means of DFL items. A scale dependent variable (DFL_score) was generated using the compute variable analysis.

Table 4.13. The ANOVA

ANOVA					
DFL_score ^a					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	13,466	4	3,366	1,799	,127 ^a
Within Groups	1229,453	657	1,871		
Total	1242,918	661			

a. Dependent Variable: DFL_score

b. Predictors: (Constant), Adresse, Salary, Academics, Sex, Activity, Your age

From the results above, it was noticed that the p-value (0,127) is greater than the significant level ($= 0.05$) which failed to reject the null hypothesis (H_0) and in this case is No, there is no statistically significant differences in the means of the DFL items. To conclude, the factor variable don't have a statistical significant effect on the DFL_score.

However, despite the overall model being a non significant result, individual predictors show changes in the levels of influence. The Table 4.14 below summarizes the coefficients:

Table 4.14. Coefficients

		Coefficients ^a			
		Unstandardized Coefficients		Standardized Coefficients	
Model		B	Std. Error	Beta	t
1	(Constant)	6.910	.284		24.342
	Your age	.001	.004	.012	.314
	Sex	-.049	.089	-.021	-.550
	Academics	.016	.032	.019	.499
	Salary	-.081	.054	-.059	-1.510
	Activity	.009	.032	.011	.284
	Adresse	.054	.089	.024	.609

a. Dependent Variable: DFL_score

Haven seen that all of the p-values exceed the 0.05 threshold, this shows that none of the above predictors are statistically significant, as for *Activity*, it still lacks statistical significance ($p = .543$), which mean little or no explanatory meaning.

Salary remains the most influential variable in terms of standardized Beta (-0.059), but also no significance.

CONCLUSION AND RECOMMENDATIONS

Since the beginning of the 20th century, the global economic system has undergone a radical evolution alongside the deepening and increasing complexity of financial markets. Throughout the historical process extending from the Great Depression of 1929 to the Global Financial Crisis of 2008, it has been repeatedly experienced that economic stability depends not only on macroeconomic indicators or institutional regulations but that the financial decisions of individuals—the smallest unit of the system—also play a decisive role. In this context, "Financial Literacy" has taken its place in the literature and on the agenda of policymakers as a fundamental competency that ensures the well-being of individuals and the resilience of national economies. However, the technological revolution brought by the 21st century, and especially the mandatory digitalization process created by the COVID-19 pandemic, has shifted this concept to the axis of "Digital Financial Literacy" (DFL). Individuals are now expected not only to know basic concepts such as savings, credit, or interest but also to manage these concepts through complex technological interfaces such as mobile applications, internet banking, blockchain technologies, and digital payment systems. In light of this global transformation, this study aimed to empirically examine the multidimensional factors affecting digital financial literacy, focusing on the case of Cameroon, a developing economy. Financial inclusion lies at the center of the economic development and poverty alleviation strategies targeted by Cameroon within the framework of its "Vision 2035"; the sustainability of this inclusion is directly associated with the level at which society adopts digital financial tools and how consciously it uses these tools.

The comprehensive literature review conducted within the scope of the thesis and the field research carried out specifically in Cameroon have revealed that the financial ecosystem in the country harbors a unique paradox. On the one hand, the fact that mobile phone penetration has reached levels of 90% and the use of Mobile Money has become widespread under the leadership of telecommunication giants such as MTN and Orange suggests that the problem of financial access has been technically overcome. On the other hand, however, it is observed that this access does not translate into deep financial usage, that is, sophisticated financial behaviors such as savings, investment, insurance, and risk management. The findings of the study show that the use of digital financial tools in

Cameroonian society remains largely limited to basic transactions such as money transfers and bill payments, and individuals remain distant from more complex financial products. This proves that there is a serious gap that needs to be closed between "access" and "literacy" and that digital financial inclusion cannot be achieved solely through infrastructure investments.

The most striking aspect of the study, which diverges from general expectations in the literature, is the statistical results obtained regarding the effect of demographic and socioeconomic factors on digital financial literacy. Traditional financial literacy literature generally argues that variables such as age, income, education level, and gender are strong predictors of individuals' financial knowledge and behaviors. For instance, as the level of education increases or income rises, financial literacy is expected to increase. However, the multiple regression and ANOVA analyses conducted with 662 participants within the scope of this thesis have demonstrated that this conventional wisdom does not hold true in the context of Cameroon. According to the analysis results, none of the variables of age, gender, education level, income level, occupation, and residence (rural/urban) could explain the participants' digital financial literacy scores (DFL_score) at a statistically significant level ($p > 0.05$). Although the income level appeared to be the most influential variable in the model, even it could not exceed the limit of statistical significance.

This finding of "insignificance" is, in fact, the most important outcome of the study that needs to be emphasized. This situation indicates that the lack of digital financial literacy in Cameroon is not specific to a certain demographic group (e.g., only low-income earners or only the elderly) but is rather a homogeneous problem that cuts horizontally across society in general. It is understood that a highly educated individual can be as vulnerable to digital fraud risks as an individual with low education, or a high-income individual can be just as incompetent in using digital investment tools. This finding reveals that digital financial literacy is a different set of competencies shaped by exposure to technology, digital trust, and experiential learning processes rather than academic knowledge gained through formal education. Therefore, simply being a "university graduate" does not provide sufficient assurance for making correct decisions in the digital financial ecosystem.

The factor analysis results of the research also support this complex structure. The fact that the Kaiser-Meyer-Olkin (KMO) test value was low and no distinct breaking point was observed in the Scree Plot graph showed that the concept of DFL could not be reduced to a single dimension or simple sub-dimensions. Digital financial literacy is a combination of many latent factors that are intertwined and affect each other, such as technical knowledge, financial knowledge, cybersecurity awareness, attitude, and behavior. The study implies that these factors are shaped around the axis of "trust" and "risk perception," particularly in the case of Cameroon. It was clearly seen in the answers in the "Barriers" section of the survey that a significant portion of the participants did not trust digital platforms, experienced a "Fear of Fraud," and therefore refrained from making transactions. This environment of distrust is one of the main reasons why individuals prefer traditional, informal, and high-risk savings groups known as "Tontines" instead of modern and regulated financial tools. The social trust and face-to-face communication offered by traditional systems outweigh the speed and efficiency offered by digital systems.

The obtained findings also reveal the structural obstacles encountered by Cameroon in the digital financial transformation process. The digital divide between urban and rural areas is not only a problem of internet access but also a problem of knowledge and adaptation. The study highlights that those living in rural areas face greater difficulties in accessing digital financial services, but these difficulties do not stem solely from physical infrastructure; at the same time, the self-efficacy of individuals in these regions regarding the use of digital tools is low. However, interestingly, the fact that the "residence" variable did not create a significant difference in the DFL score in the statistical analysis suggests that although those living in urban areas have access to infrastructure, they are not much further ahead of the rural segment in using these tools effectively. This confirms that the problem is a national "digital competency" and "adaptation" problem rather than a spatial one.

In light of these results, it is clear that the strategies to be developed for policymakers and financial education providers must go beyond traditional demographic targeting. Current findings show that isolated education programs targeting only women or only youth will remain limited in solving the problem. Instead, holistic approaches

based on "behavioral finance" principles, aiming to increase individuals' trust in technology and manage digital risk perception, are needed. Financial education programs should cover not only theoretical financial knowledge (budgeting, interest calculation) but also practical digital skills (mobile application security, password management, recognizing phishing attacks). Increasing cybersecurity awareness, in particular, is of vital importance to restore individuals' trust in the system and encourage the use of digital financial tools.

Furthermore, Cameroon's strong social capital and traditional structures like "Tontines" should be evaluated as an opportunity for the dissemination of digital literacy education. Digital financial service providers and government institutions can integrate technology into the trust circles that individuals are accustomed to by using these local community networks as educational channels. For example, applied training provided through community leaders can break the perception of technology as "foreign" and "frightening" and accelerate the adoption rate. In addition to this, regulatory institutions (such as COBAC) need to strengthen legal frameworks that will increase the security of digital financial platforms and establish transparent mechanisms that protect consumers. Knowing how users can seek their rights in case of fraud or error is one of the most important elements that will increase trust in the system.

Improving technological infrastructure must also be carried out simultaneously with educational initiatives. As emphasized in the study, power outages and inadequacies in internet infrastructure, especially in rural areas, damage the continuity and reliability of digital financial services. The number of projects combining renewable energy and digital education, such as Orange Digital Houses, should be increased, thereby overcoming infrastructural barriers while simultaneously developing the digital competencies of the local population.

In conclusion, this thesis study has revealed that digital financial literacy in Cameroon is a much more complex and structural problem, independent of demographic characteristics such as individuals' age, income, or education level. The spread of the opportunities offered by financial technologies (FinTech) to the base and the achievement of Cameroon's 2035 goals are possible beyond technological access, through individuals "trusting" these technologies, recognizing "risks," and adapting "behaviorally." Digital

financial literacy is not a luxury in modern economies but a prerequisite for individual financial well-being and social development. This study sheds important light on the literature and policymakers by emphasizing that demographic labels and superficial solutions must be transcended on the path to this goal and that a multi-layered strategy extending from education to infrastructure, from legal regulations to cultural adaptation must be adopted. It is recommended that future research focus on qualitative methods and psychological variables to examine the causes of the statistical insignificance revealed by this study in depth, which will contribute further to the understanding of the subject.



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APPENDICES

Appendix A: Survey Questionnaire

MULTIDIMENSIONAL FACTORS AFFECTING DIGITAL FINANCIAL LITERACY: THE CASE OF CAMEROON

Financial Literacy, Digital Financial Inclusion, and Cybersecurity Awareness in Cameroon

Instructions to Respondents:

Please answer the following questions honestly. Your responses will remain confidential and will be used solely for academic research purposes.

Section 1: Demographic Information

1. Age:

- ☐ 18–25 ☐ 26–35 ☐ 36–45 ☐ 46 and above

2. Gender:

- ☐ Male ☐ Female ☐ Other

3. Education Level:

- ☐ No formal education
☐ Primary
☐ Secondary
☐ Tertiary
☐ Postgraduate

4. Employment Status:

- ☐ Employed
☐ Self-employed
☐ Unemployed
☐ Student

☐ Retired

5. Income Level

☐ Low (0-35000)

☐ Medium (35000-70000)

☐ High (70000 and above)

6. Residency (Region/City):

Section 2: Financial Literacy

7. Do you regularly budget your monthly income?

☐ Yes ☐ No

8. Do you understand how interest rates work?

☐ Yes ☐ No

9. What does “inflation” mean to you?

☐ Increase in prices over time

☐ Decrease in purchasing power

☐ Not sure

10. Do you compare financial products before choosing one (e.g., loans, savings)?

☐ Always ☐ Sometimes ☐ Never

11. Do you save money regularly?

☐ Yes ☐ No ☐ Occasionally

Section 3: Digital Financial Literacy

12. Do you use mobile banking apps or digital wallets?

☐ Yes ☐ No

13. How confident are you in using financial apps?

☐ Very confident ☐ Somewhat confident ☐ Not confident

14. Have you ever read the terms and conditions of a financial app?

☐ Yes ☐ No

15. Do you understand what digital consent means (e.g., sharing personal data)?

☐ Yes ☐ No

16. Have you ever used a fintech platform (e.g., for loans, investments)?

☐ Yes ☐ No

Section 4: Cybersecurity Awareness

17. Do you use strong, unique passwords for your financial accounts?

☐ Yes ☐ No ☐ Not always

18. Have you ever received suspicious messages asking for financial information?

☐ Yes ☐ No

19. Do you know how to recognize phishing websites or scams?

☐ Yes ☐ No ☐ Not sure

20. Do you use two-factor authentication (e.g., SMS codes, app verification)?

☐ Yes ☐ No

21. Have you ever experienced digital fraud or identity theft?

☐ Yes ☐ No

Section 5: Attitudes and Barriers

22. Do you trust digital financial platforms?

☐ Yes ☐ No ☐ Somewhat ☐ On condition

23. What prevents you from using digital financial services more often?

☐ Lack of knowledge

☐ Fear of fraud

☐ Poor internet access

☐ High transaction fees

☐ Other: _____

Thank you for your participation!

